MINING CONGRESS JOURNAL

FFICIAL

ICATION

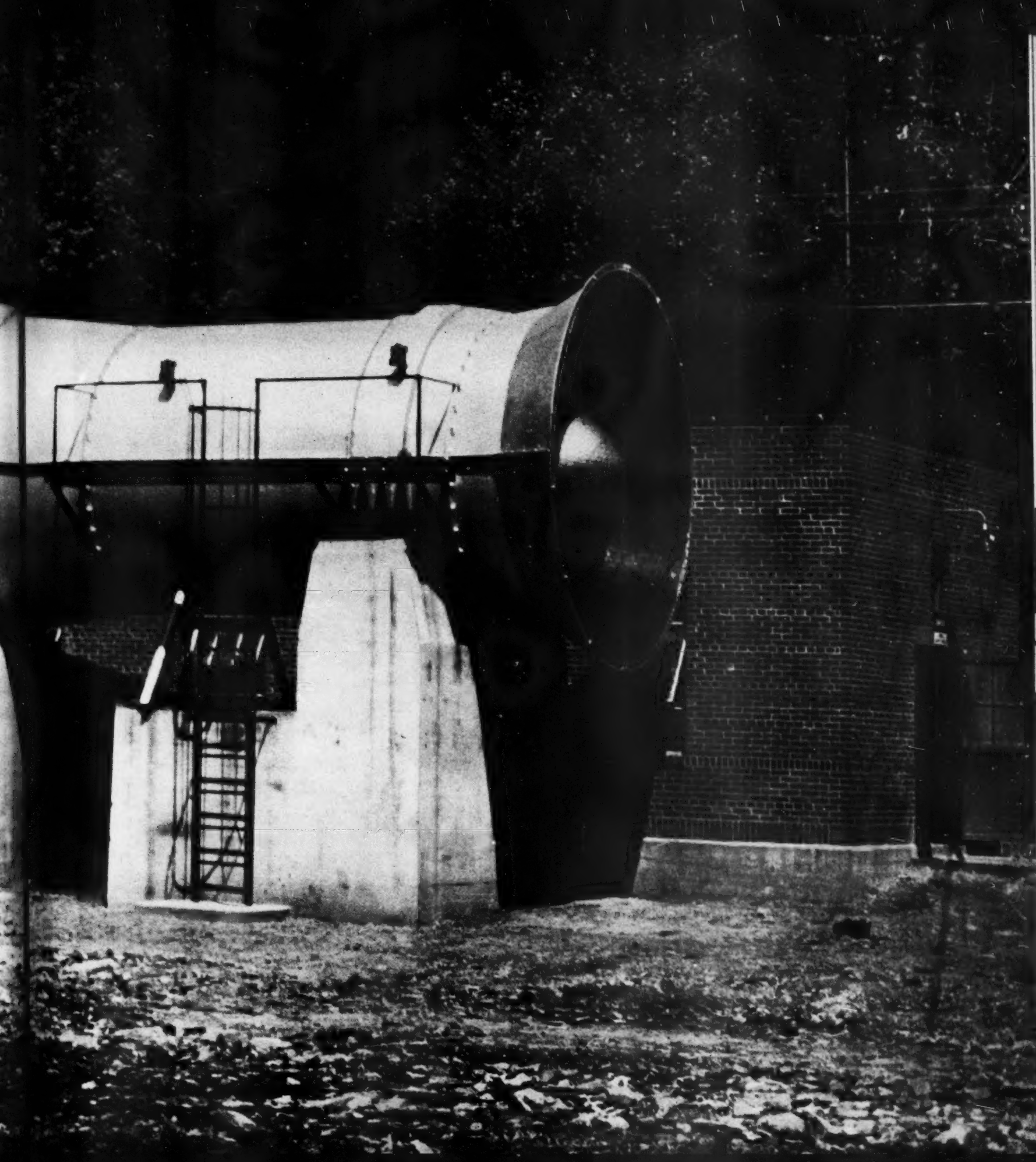
A Job to Do! V

MINING has a wartime job to do and there's only one way it can be done—that's through the 100% cooperation of every mine operator, every mining manufacturer and every mining association.

It's up to mining to get out the raw materials for the implements of modern war, and to furnish the solid fuel to power our armaments factories. The problems incident to these stepped up production demands—whether they be matters of operation, personnel, legislation, taxation, or economic issues—can best be met through the coordinated efforts of all branches of mining.

The Mining Congress pledges its full services toward the job at hand. Through its nation-wide representation of the industry, it will interpret the industry, its needs and its problems, to the agencies of government. Through its conventions and expositions, it will continue to further the modernization of mines by maintaining these proven opportunities for exchange of ideas and experiences, and for full cooperation between manufacturers and operators. Through the Journal and its other publications, it will continue to speak to and for the entire industry.

The Mining Congress requests the support of both operators and manufacturers, that its services to the industry may be fully sufficient to the need.



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THE AMERICAN MINING CONGRESS

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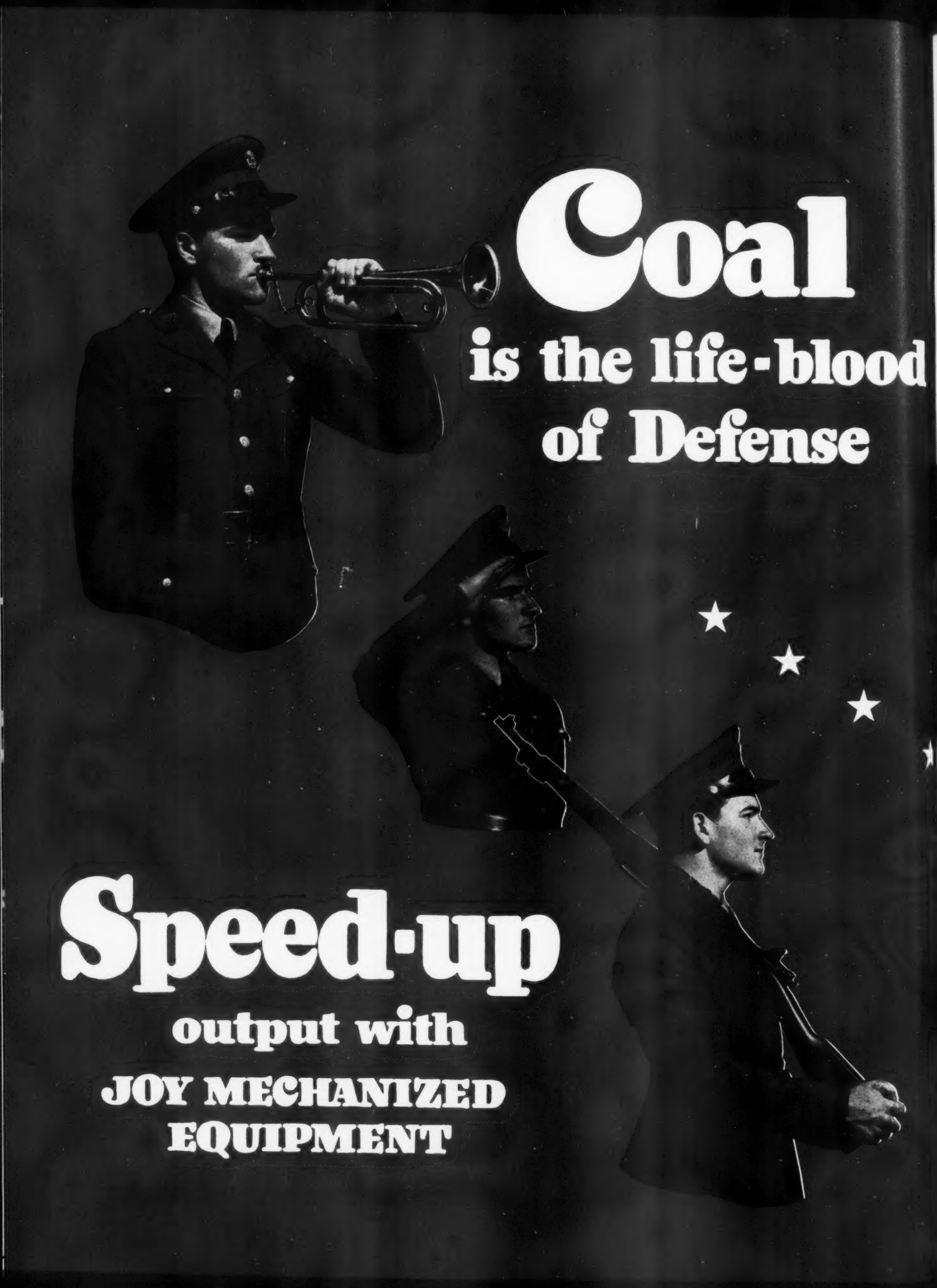
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of Defense
Speed-up
output with
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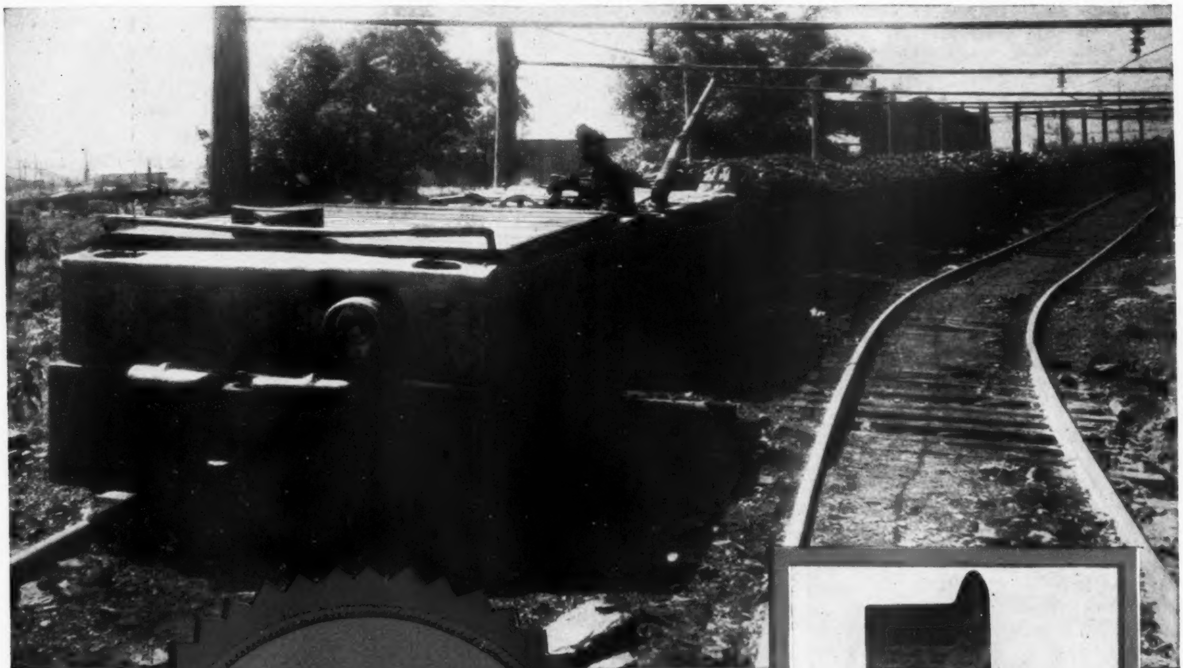

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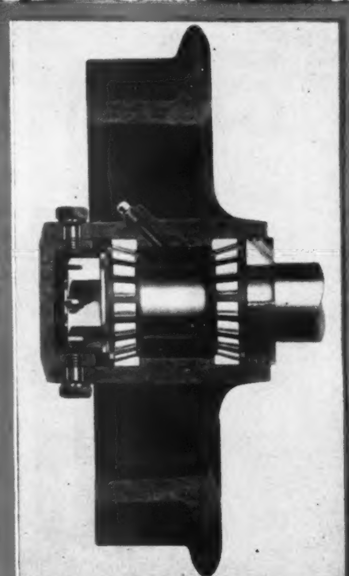
Timken Bearings are helping mining equipment do a great job for the Victory Program. They will be just as valuable in the competitive era following Victory.



Timken Roller Bearing mounting as used in mine cars.

The photograph shows a train of Enterprise mine cars equipped with Timken Bearings at Imperial Smokeless Coal Company, Quinwood, W. Va. There are 250 of these large capacity cars in service. The old cars were abandoned and the mine modernized under new ownership.

Nearly 400,000 mine cars now are rolling on Timken Bearings, to say nothing of loaders, conveyors, hoists and specialized equipment of various kinds.

Post-war conditions may be tough—but not too tough for new and redesigned equipment containing a full complement of Timken Bearings.

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STEEL is writing today's headlines—on land, on the sea, and in the air—as America forges ahead on National Defense and in its aid to friendly nations. It will be very much in the news, too, when peace comes, for it will play a large part in the world's reconstruction. And the birthright of steel is IRON ORE, dug from endless resources by powerful MARION shovels working twenty-four hours a day. It is another phase of MARION'S formidable position in the National Emergency.
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The New Bethlehem No. 5 Steel Tie

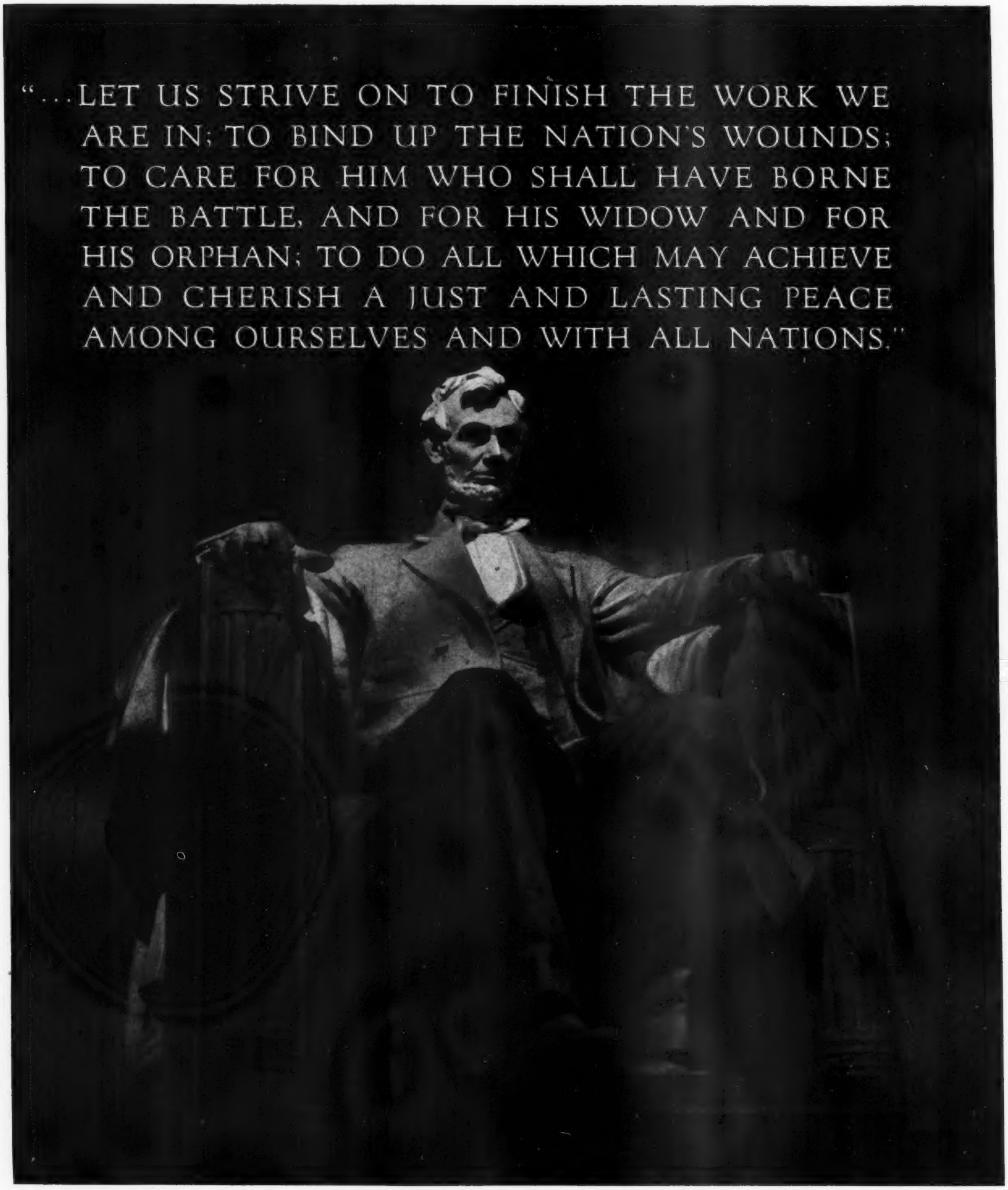
As more and more operators have taken the sensible turn to heavier rail sections in room track, the need has arisen for a tie as rugged in proportion. Now Bethlehem fills this need completely with the new No. 5 Steel Mine Tie—a stronger, sturdier tie all around, with stronger, sturdier clips. The new No. 5 Steel Tie was specifically designed and built to take 40-pound rail. Try the Bethlehem No. 5 Steel Tie yourself and see how it stands up. For complete information on the new No. 5 Tie, write to Bethlehem Steel Company, Bethlehem, Pa., for Folder 475A.

SECTION PROPERTIES OF NEW TIE

Weight per ft. of section	5 lb.
Moment of Inertia	0.192 in.^{4}
Section Modulus	0.316 in.^{3}
Neutral Axis from Base	0.453 in.

New No. 5 Tie, in black, compared with No. 4 and No. 3 Bethlehem Ties, in light and dark gray.

BETHLEHEM STEEL COMPANY


"...LET US STRIVE ON TO FINISH THE WORK WE ARE IN; TO BIND UP THE NATION'S WOUNDS; TO CARE FOR HIM WHO SHALL HAVE BORNE THE BATTLE, AND FOR HIS WIDOW AND FOR HIS ORPHAN; TO DO ALL WHICH MAY ACHIEVE AND CHERISH A JUST AND LASTING PEACE AMONG OURSELVES AND WITH ALL NATIONS."

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THE RISING TIDE

FROM the information contained in this issue of the Journal, one particularly important conclusion may be drawn: The mining industry has not waited on any Truman Committee report, or on prodding from governmental agencies, to perform its patriotic duty of producing to the utmost. The attitude has been, and should be, that the metals, the solid fuels and the non-metallics will be forthcoming to whatever extent is necessary to provide the sinews of war. Even in the case of those metals in which we are in ordinary times deficient, such as manganese, chrome, tungsten, quicksilver, and antimony, production is mounting, new mines are being opened, and new processes are being evolved for treatment, to the end that we may now, to a far larger measure than heretofore, be self-sufficient for the duration, and even, perhaps, after the war.

The railroads too have met the emergency in a magnificent manner. Last spring there were real fears that the railroads might not be able to move to market the quantities of coal needed, in addition to the many other emergency demands made upon them. Now, the demands this coming year will be even heavier. To move the tremendous quantities of iron ore and coal required, as well as the many other products which must be transported to supply the war needs, will take miracles of organization. The railroads may be able to do it, as they have in the past; but shippers and consumers should take heed NOW and stockpile materials as far ahead as possible. Coal, in particular should be purchased and stockpiled well in advance of consumption, to enable the railroads to handle peak demands for perishable products.

APPROVED BY CENSOR

IN THE middle of January the newly established Office of Censorship in Washington, under the Directorship of Byron Price, issued a code of wartime practices for newspapers, magazines and other periodicals. It is obviously to the country's benefit to prevent, insofar as possible, the dissemination of information which might be picked up and used by the enemy to his own advantage. In accordance with democratic principles, the code aims to achieve this end through voluntary cooperation of the publishing business, leaving to editorial staffs the immediate decisions as to whether material could conceivably be informative to the enemy. The President has said that such curtailment of the traditional freedom of the press as may be necessary, will only be that "in harmony with the best interests of our free institutions." The code applies to all magazines, including technical and industry publications such as the Journal, and the Journal will of course comply fully and voluntarily. The contents of this, the 1941 Review issue, have been examined carefully, and any estimates of future production, which might be harmfully used, have been eliminated, except where figures have been issued by competent public authority, such as an agency or department of the Government, and are therefore already public knowledge.

In the interest of national safety future issues will be edited in similar fashion.

EXPLOSIVES CONTROL

THE law regulating the use of explosives went into effect when war was declared. This establishes a control over all explosives for industrial uses, and provides for licensing vendors, dealers and users.

The Health and Safety Branch of the U. S. Bureau of Mines has been charged with the responsibility of exercising this control, and a special Explosives Control Division has been established for the purpose. A general license was issued on February 3, as an interim measure until a more detailed method can be set up. Specific licenses will be required March 1.

Already instances have come to light where explosives in the hands of dealers and consumers have been stolen by saboteurs. The War Department is pressing the Bureau of Mines for immediate action on powder magazines and storehouses, and the results will be drastic. It cannot be urged too strongly that mining men immediately tighten up on the handling of explosives under their charge. None but patriotic, dependable men should be permitted to distribute or handle explosives in quantity.

ANNUAL REVIEW

» PROGRESS IN 1941 «

The review of the mining industry, bituminous coal and anthracite, metals and non-metallics, presented this month, is a gauge by which to judge the state of advancement of our rearmament effort. During the past year practically all mining operations have been speeded up, new mines have been opened and, for the first time in many years, a shortage of skilled mine labor has become a factor.

Without a doubt the most strenuous days the industry has ever experienced lie ahead, to pour forth in ever increasing quantities the vast supply of raw materials demanded for a modern, successful war. This must be done, and it will be done, for that is the contribution which we as an industry can make to keep the world free for ourselves and our descendants.

BITUMINOUS COAL—1941

Trend Toward More Efficient, Safer Operation Continues

THE progress of coal mining during 1941 has been profoundly affected by, first, the defense effort and then by the placing of industry on a war footing. The effect of the defense program became more and more marked as the year passed, both as to tonnage production and as to development of improved methods by the addition of new equipment and the replacement of obsolete machinery. The effort toward greater efficiency definitely followed an upward curve until the Pearl Harbor incident; with our entrance into the war the coal industry veered sharply into the direction of maximum production. This, occurring in December, was not particularly noticeable before the year end, but the current year will see a definite development toward greater tonnage.

How Much Coal Can Be Produced?

There is some question as to how much bituminous coal can be mined with present facilities, and the year 1929, with its production of over 530,000,000 tons, is often cited as marking the probable peak. Whether or not this becomes the actual peak can perhaps be answered by an examination of the accompanying chart, which was prepared by the Bituminous Coal Division of the U. S. Department of Interior and gives a comparison of the weekly productions of bituminous coal for 1929 and 1941. The 1941 curve has several depressions, the major one being due to the six weeks' strike shutdown during April and May, followed by one of lesser consequence caused by the holiday vacations the first part of July. These interruptions to production, while serious at the time, probably had small effect on the total year's output of slightly over 500,000,000 tons, as the high rate of loadings preceding and following these periods may have offset the losses. Since coal production is directly geared to consumption, the 1941 demand was fully met despite the shutdowns.

Present productive ability is indicated by the course of the curve during September and October. In this period a sustained output of more than 11,000,000 tons per week was maintained, continued for a sufficient time to prove that this rate can be expected as a regular performance if other factors do not interfere. The adequacy of transportation and the number of miners available for employment are factors which may possibly affect the situation. It is impossible to prophesy the extent to which labor and transportation will be affected by other war needs during the coming year; but if the trend of labor from coal mining into other war industries continues, the results will undoubtedly be reflected in the production rate.

Another factor to be considered is the difficulty of obtaining machines, equipment, and repair parts. Some such shortages have already occurred but not of sufficient consequence to affect production; action by the Mining Priorities Division of the OPM

has been giving considerable relief. It is self-evident that if the mines are to increase or even to maintain present production levels a supply of machines, equipment, and parts must be forthcoming.

Operating Improvements

During the past year the trend toward greater efficiency, improvements in machines, and the addition of mechanical equipment was maintained in all of the productive operations of loading, cutting, haulage, and preparation, as well as in auxiliary phases such as maintenance, ventilation, and roof support.

Mobile loading machines, both track and tractor mounted, and stationary mechanical conveyor loaders continued to be used on an increasing scale, as indicated by an article on this subject in this issue of the JOURNAL. While a very large tonnage continues to be loaded by hand shovels onto conveyors, the trend is definitely toward loading conveyors by machines; that is, by either the mobile tractor type or the duckbill mechanical loader. Figures have not yet been compiled to show the amount of coal produced by machines and conveyors in 1941, but this probably has reached 40 percent of the total bituminous tonnage.

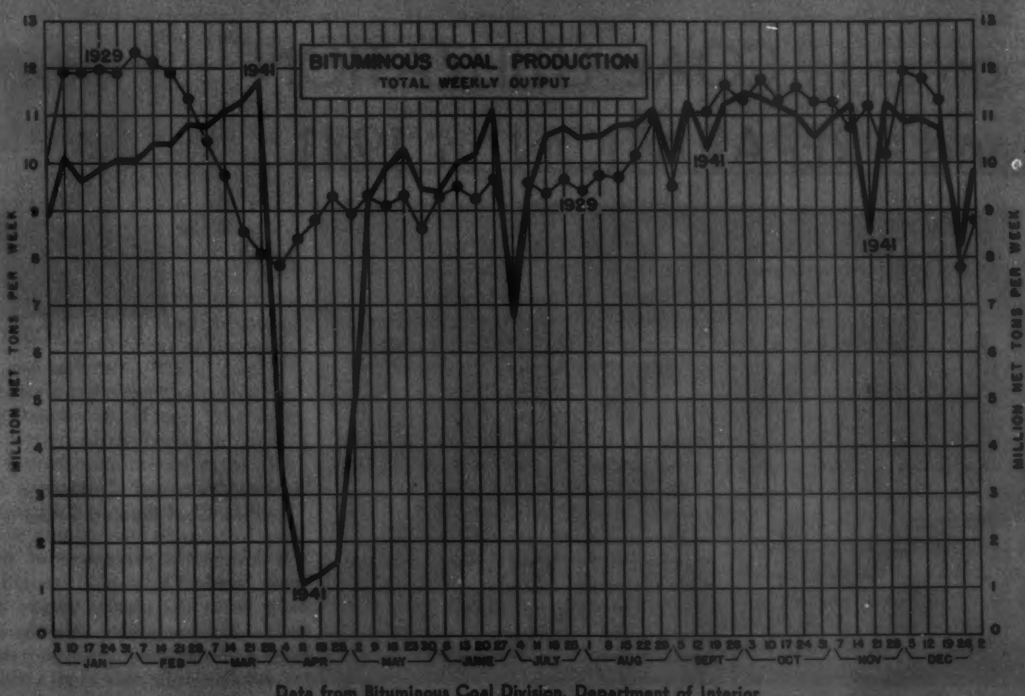
Service haulage has followed three lines of development — mine cars, shuttle cars, and conveyors. Each of these methods is proving its effectiveness and economy for its own conditions and, since these methods are to a certain extent interchangeable, there are still controversies as to which is the most effective. All three methods are being used in numerous installations and there is assurance that all will remain as definite parts of mining.

Power is becoming increasingly important in coal mining operations and a recent survey covering an important area of the eastern Appalachian field shows marked increases in power consumption. Mines of larger capacity in this area are now using 50 percent more KWH than in 1936 and, reduced to a tonnage basis, these same mines used 30 percent more KWH per ton of coal mined than in 1939. However, it is well worth noting that the power cost per ton of coal during this same period has increased only approximately 10 percent, which indicates marked improvement in the efficient use of electric current. More efficient use of motors, better control of power factors, safer and more flexible means of power distribution and conversion, and the increasing use of fan-cooled motors have all contributed toward the ability of bituminous mines to produce more tonnage per KWH of consumption.

Studies of Roof Deterioration Undertaken

An interesting new development, which illustrates that the coal industry is examining every avenue toward the reduction of cost, are some studies and experiments now under way to determine the possibility of preventing roof falls. Rising labor rates have made the cost of cleaning falls a serious item of expense, and better timbering methods and the use of steel and preserved timber are now being regarded as economies in most instances. However, going deeper into the matter, a number of experiments are being conducted along scientific lines to examine the properties and characteristics of roof rock and discover the reasons for roof failures. Chemical analyses and microscopic examination of rock structure have opened up possibilities for applying measures that will prevent roof deterioration.

The allaying of coal dust in the operations of cutting and mechanical loading are receiving considerable attention and, as in the case of roof examinations, here again scientific methods are being applied. The U. S. Bureau of Mines, in cooperation with several mining companies, has conducted numerous experiments with various types of water sprays under high pressure to give an atomizing



Data from Bituminous Coal Division, Department of Interior

Trained men and sturdy mechanical equipment speed production

effect; these have proven very effective in removing dust from the mine air. Certain "wetting" compounds are also being employed and it seems assured that trials now under way will reduce the dust hazard underground.

It has not been the intent here to describe all of the new things that are being done, or even to list those of major importance. The recent improvements in coal preparation methods, ventilation, and maintenance would each require an article in itself, but the whole trend for the year 1941 can be summed up by saying that bituminous coal mining is continuing to use scientific methods of approach to its operating problems, with the result that mining is becoming more efficient in all phases. The call for "all-out" production this coming year will undoubtedly accelerate this trend.

Progress in COAL UTILIZATION and PREPARATION in 1941

By J. E. TOBEY
Vice President
Appalachian Coals, Inc.

One can gather from the following brief statement, that definite progress has been made, in the bituminous coal industry, in providing clean coal and in developing means of utilization to conform to the demands for smokeless burning. Mr. Tobey is a leader in these developments and is in a most favorable position to give the following concise review.

THE year 1941 can be characterized as one in which a substantial progress has been made on the problems of coal preparation and utilization.

For a period of years the American standards of living have been steadily advancing. The broom was replaced by the vacuum cleaner. Messy preparation and distribution of food products had given away to canned and frosted foods. The open milk can and dipper had disappeared; the cat had come out of the cracker barrel. Electric lights had displaced kerosene lamps; electric refrigerators kept the ice man out of the kitchen; electric appliances furthered home sanitation. The horse and buggy had been replaced by the automobile. Each year living had become more streamlined and immaculate. Modern refinements in material things have made people more conscious of dirt—and smoke.

Smoke Abatement Ordinance Intensifies Coal Burning Research

Suddenly the enactment of the St. Louis Smoke Ordinance brought into sharp focus the idea of smoke abatement. So spectacular was the newspaper and magazine publicity attendant on this ordinance that a Pulitzer Award for Journalism was given to a

newspaper man for his articles about it. Magazines with enormous circulation added glamor to the St. Louis story. Garden clubs, women's organizations and civic bodies generally were caught by its popular appeal. All inaugurated campaigns to eliminate smoke.

The St. Louis ordinance forbids the use in hand-fired furnaces of bituminous coal having a volatile content of more than 23 percent. That the volatile content of fuel is *NOT* the determining factor in smoke production is quite overlooked in the common outcry. The other hydrocarbon fuels, natural gas and fuel oil, are 100 percent volatile and yet these fuels are burned without restriction simply because efficient equipment for their proper burning has been developed.

Out of the general clamor one definite result is that the coal industry has been constrained to tackle the problem more realistically than ever before. Legislative restriction on the use of high-volatile coal has put coal utilization engineers on their mettle.

Coal is being blamed for all city dust and dirt and even country fogs.

Of course, the St. Louis method is not an engineering approach to the solution of the problem. It is simply a prohibitive and legislative action.

The problem will finally be solved on a sound engineering basis. In the past year, engineers have accepted the challenge and good engineering will not only abate smoke, but solve the economic and sociological factors involved as it always does.

Committee Formed to Tackle the Problem

A direct consequence of the concern of the coal industry was the formation of the Coal Producers Committee for Smoke Abatement. Another result was the intensive study on the part of Bituminous Coal Research, Inc., for the improvement of domestic heating equipment. While not all atmospheric smoke is chargeable to domestic consumers of coal, the fact that 40 percent of the homes in America are heated with stoves made this angle of approach to the smoke abatement problem seem to be the logical one. The combustion features of the domestic stove had been lagging in comparison with advances in other household equipment.

Although the abatement of smoke by legislative fiat appeals to the popular fancy, more substantial and enduring progress is being made in the laboratories of our engineering colleges, the research institutions, the foundries and machine shops of stove manufacturers and in the creative minds of inventors.

In the past year, 28 stove manufacturers have joined with Bituminous Coal Research, Inc., on a cooperative program to investigate new principles of coal combustion with a view to developing a smokeless heater. Specific investigations are being conducted on the use of bituminous coal in magazine-type space heaters of new design, on cooking ranges and on service water heaters.

Smokeless Burning Research Continues

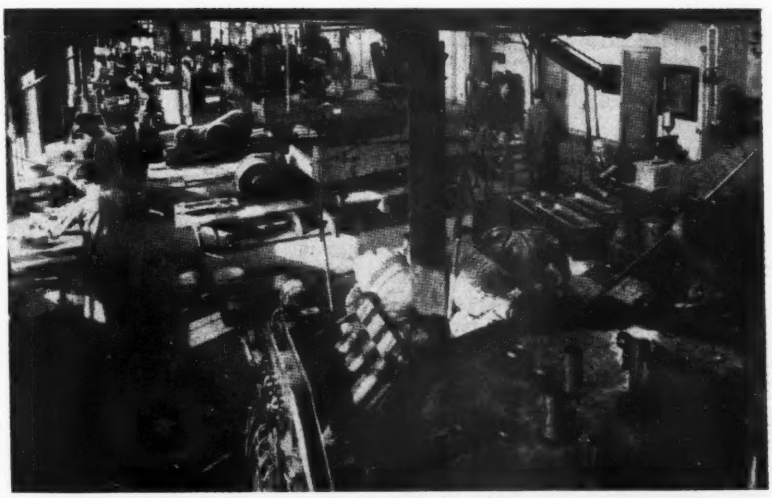
The University of Illinois has concerned itself with a new design of household furnace which burns Illinois coal smokelessly in two stages. The Illinois State Geological Survey has also made progress in adapting an invertible grate principle of underfeed combustion for smokeless burning of small egg-size coal. The Dewitt device, which is designed to burn bituminous coal smokelessly in present furnace equipment in a two-stage operation, is now undergoing rigid and thorough tests by interested parties.

At Battelle Memorial Institute the coal industry has sponsored a program to seek for a suitable principle of burning coal and handling ash so as to give a wider range in the types and sizes of coal suitable for use in domestic stokers. Ultimately this will lead to the design and construction of a fully automatic stoker with bin feed and mechanical ash removal. Work along somewhat similar lines is also in progress at Pennsylvania State College, the U. S. Bureau of Mines and the Illinois Geological Survey.

Coal Constitution and Chemistry Studied

Considerable work at the Coal Research Laboratory of the Carnegie Institute of Technology and other engineering colleges and research institutions has been in progress on such important subjects as fundamental studies of coal constitution and coal chemistry. The results of these studies continue to fill the storehouse from which applied research and the fuel engineering of the future can draw valuable data. In striking contrast to the quiet and thorough manner in which the coal scientists are moving ahead is the newspaper publicity attendant upon the announcement of some inventor who claims to have a "secret formula" for aiding in the combustion of coal so the householder can burn it more efficiently and smokelessly. While this publicity is not usually long lived, nevertheless every such claim has to be thoroughly investigated.

The results of these investigations generally follow the same pattern—that the inventor, or his misguided backers who live in hopes of cashing in on a gullible public, are unwilling to submit their treatment or their treated product to unbiased, accurately controlled tests. That these formulas have not been successful in the past is, of course, no warranty that a probability (although very remote) still exists that something may be discovered in the future to act as



Laboratory of Battelle Memorial Institute, Columbus, Ohio, engaged in coal research

a chemical aid to combustion. Certainly the discovery of the effects of tetraethyl lead and its effects on the combustion of gasoline in the internal combustion engine proves the likelihood of this probability.

There Are Many New Industrial Developments in the Use of Coal

Turning from the domestic situation, let us see what progress is being made in the commercial and industrial fields. Here we find manifold developments: a coal-burning internal combustion engine, pulverized firing of forge furnaces and radiant tubes, small gas producers, studies of combustion on traveling grates, flow characteristics of coal ash slags, and the use of pulverized coal in railroad locomotives.

Coal Preparation Methods Progress

In the field of coal preparation we also find progress being made in diverse activities. The Illinois Geological Survey are adding a preheater and a prevolatilizer to their large scale rotary press setup to prepare Illinois coal fines for briquetting without a binder.

The Alabama Station of the U. S. Bureau of Mines and the Battelle Memorial Institute are continuing their work on dewatering and cleaning of coal; the removal of pyrite from fine coal, the use of heavy liquids for the commercial preparation of coal with minimum ash content, forms of iron in coal ash, fundamentals of jigging, horizontal and vertical current classifications, and other subjects are receiving much needed attention. There is also a large amount of long range work being conducted which is not sufficiently advanced so progress reports can be made. Likewise work that is privately sponsored and which will ultimately benefit the entire coal industry is under way, although we are unable to give definite reports of their progress.

From the detailed examples we have given of the progress in coal preparation and utilization, it is evident that a substantial beginning has been made in these fields. Probably it is evident only to those working in this field that we are merely on the fringe of great accomplishments. The possibilities of developments in the better preparation and utilization of coal, unheard of today, stir the imagination. The challenges that coal offers are great enough to capture the interest of every scientist, chemist, engineer and technician who can envision making an enduring contribution to the cause of humanity.

SALES of MECHANICAL LOADING and CLEANING EQUIPMENT For Use in Coal Mines in 1941

As an indication of the progress made during the past year in the modernization of coal mines, the number of mechanical loading units sold to the industry, rose from 2,037 in 1940 to 2,519 in 1941, an increase of 23.7 percent.

By
W. H. YOUNG
R. L. ANDERSON
G. A. LAMB
F. M. SHORE*

TOTAL production of mechanically cleaned bituminous coal in 1939, the latest year for which data are available, was 72,576,085 net tons at the mines and 6,800,587 tons at central washeries, a total of 79,376,672 tons. Production of mechanically loaded coal in 1939 was 110,711,970 tons at underground bituminous mines and 11,773,833 tons at underground anthracite mines, or a total of 122,485,803 net tons. The estimated capacity of mechanical loading equipment introduced in bituminous coal mines was 30.8 percent greater in 1941 than in 1940. The total number of units sold to bituminous mines increased from 1,845 in 1940, to 2,185 in 1941, and the grand total for bituminous and anthracite increased during the same period from 2,037 to 2,519, or 23.7 percent. Sales to lignite mines are included under the bituminous classification for purposes of this survey.

Sources of Information

All 1939 data on bituminous coal production and mechanical loading equipment in use was compiled by the Bureau of the Census, U. S. Department of Commerce, in cooperation with the Bituminous Coal Division, U. S. Department of the Interior.

The data on mechanical cleaning of bituminous coal are compiled from reports courteously furnished by manufacturers of mechanical cleaning equipment for use at bituminous coal mines, supplemented with data from various trade journals.

The figures on mechanical loading are based upon reports courteously supplied by all known manufacturers of mechanical loading machinery for underground use in coal mines. The number of manufacturers reporting in 1940 was 32.

* Messrs. Young, Anderson, and Lamb are members of the Economics Branch, Bituminous Coal Division, U. S. Department of the Interior. Mr. Shore is Chief, Coal Economics Division, U. S. Bureau of Mines.

Printed with permission of the acting director of the Bituminous Coal Division, and the director of the Bureau of Mines.

Mechanical Cleaning of Bituminous Coal

Installations of mechanical cleaning equipment at bituminous mines were made in 11 states during 1941, according to the reports on sales. Although these sales were made during 1941, several of the plants will not be completed until early in 1942. The total capacity of cleaning plants sold in 1941 is estimated at 8,000 net tons of cleaned coal per hour, as compared with 12,000 tons capacity sold in 1940. Installations at mines not previously having cleaning plants accounted for one-half the total capacity, and additional equipment at mines with previous cleaning equipment accounted for the other one-half. About 90 percent of the total capacity of the 1941 sales was reported for wet-washing plants, and the other 10 percent for pneumatic cleaning plants. The largest number of installations was reported by West Virginia, with Pennsylvania, Alabama, Kentucky and Illinois following in the order named. In terms of capacity, West Virginia was the greatest, with Pennsylvania, Kentucky, Illinois, and Indiana following.

Mechanical Loading of Bituminous and Anthracite

Total units sold by type.—The number of mobile loaders sold during 1941 amounted to 368, as compared with 233 in 1940, an increase of 57.9 percent. This is the highest number of annual sales ever recorded. The former peak year of sales for mobile loaders was 1936, when 344 sales were made.

Sales of scrapers decreased from 39 in 1940, to 11 in 1941, or 71.8 percent.

Sales of conveyors registered an all-time high in 1941, with a record of 2,130 sales, an increase of 20.9 percent over 1940. The conveyor unit sales figures include both hand-loaded types and those equipped with duckbills or other self-loading heads. In counting sales of duckbills and shaker conveyors on which they are used, there is a certain overlapping of sales, the extent of which cannot be accurately determined. The number of duckbills cannot be shown separately without disclosing the figures of individual companies.

Sales of pit-car loaders increased from 3 in 1940 to 10 in 1941. Table 1 shows the number of units of mechanized loading equipment sold to bituminous and anthracite mines as reported by manufacturers for the years 1934 to 1941, inclusive, with percent of increase or decrease in 1941 over 1940.

Total sales by States.—Shipments of mechanical loading devices were made to 20 states in 1941. Table 2 shows the total number of units placed in each state or region. In a few instances, separate figures are not shown for each state to avoid disclosing the business of individual manufacturers. Types of equipment in approximate order of capacity are shown by letter symbols. For example, in West Virginia 833 units of loading equipment were sold. In this aggregate of new equipment sold, conveyors (indicated by "C") furnished the largest addition to capacity, followed by mobile loading machines ("L"), pit-car loaders ("P"), and scrapers ("S"). A total of 2,185 units of all types were shipped to bituminous mines and 334 to anthracite mines in 1941.

Types of machines sold compared with units in use in bituminous mines.—Table 3 shows the change in demand since 1931 for the different types of mechanical loading devices. Mobile loaders in active use, as reported by mine operators, increased from 583 in 1931 to 1,573 in 1939. Sales of mobile loading units in 1940 and 1941 were 233 and 367, respectively. The total sales in these two years amounted to 38.1 percent of the number in active use in 1939.

Scrapers in use decreased from 146 in 1931, to 131 in 1939, or 10.3 percent. Total sales in 1940 and 1941 were 36 and 8 respectively, or 33.6 percent of the total number in use in

TABLE 1—UNITS OF MECHANIZED LOADING EQUIPMENT SOLD TO BITUMINOUS AND ANTHRACITE MINES, AS REPORTED BY MANUFACTURERS, 1934 TO 1941, INCL.[1]

	1934	1935	1936	1937	1938	1939	1940	1941	Percent Increase (+) or Decrease (—) 1941 from 1940
Mobile loaders	55	115	344	292	241	292	233	368	+ 57.9
Scrapers[2]	34	22	28	29	10	26	39	11	— 71.8
Conveyors[3]	610	681	994	1,095	990	1,311	1,762	2,130	+ 20.9
Pit-car loaders	26	28	11	32	139	2	3	10	+233.3

[1] Data for 1934 to 1936 includes reports from 28 manufacturers; 1938, 1939, 1940, and 1941 data include 29, 31, 32, and 32 manufacturers, respectively.
[2] Reported as scrapers or scraper haulers and hoists.
[3] Includes hand-loaded conveyors and those equipped with duckbills and other self-loading heads. As sales of both loading heads and shaker conveyors are counted, the figures involve a certain measure of overlap, which cannot be determined accurately. It should also be noted that a small number of conveyors were for use in conjunction with mobile loading machines.

TABLE 2—TOTAL NUMBER OF UNITS OF MECHANIZED LOADING EQUIPMENT SHIPPED FOR USE IN EACH STATE OR REGION IN 1941

(L—Mobile loading machines; P—Pit-car loaders; S—Scrapers; C—Conveyors and duckbills)

	Number of units of all types shipped in 1941	Types of equipment in approximate order of capacity in 1941
Northern Appalachian States:		
Pennsylvania	321	L.C.S.
Ohio	176	L.C.
Maryland	16	C.
Southern Appalachian States:		
West Virginia	833	C.L.P.S.
Virginia	71	C.L.
Kentucky	249	C.L.
Alabama	164	C.L.
Tennessee and North Carolina	51	C.L.
Middle Western States:		
Illinois	164	L.C.
Indiana	10	L.C.
Trans-Mississippi States:		
Arkansas, Oklahoma, and Iowa	25	C.L.
Colorado	38	C.L.
New Mexico, Utah, Montana, Washington	29	C.L.
Wyoming	38	C.L.
Total bituminous	2,185	C.L.P.S.
Pennsylvania anthracite	334	C.L.S.
Grand total	2,519	C.L.P.S.

TABLE 3—SALES OF MECHANIZED LOADING EQUIPMENT IN 1940 AND 1941 COMPARED WITH TOTAL NUMBER OF MACHINES IN ACTIVE USE IN PRECEDING YEARS

	Number of machines in active use, as reported by mine operators [1]								Number machines sold as reported by manufacturers	
	1931	1932	1933	1934	1935	1936	1938	1939	1940	1941
Bituminous mines:										
Mobile loading machines	583	548	523	534	657	980	1,405	1,573	233	367
Scrapers	146	128	93	119	78	106	117	131	36	8
Pit-car loaders	3,428	3,112	2,453	2,288	2,098	1,851	1,392	873	3	10
Conveyors equipped with duckbills and other self-loading heads	165	159	132	157	179	234	346	559	[3] 1,573 (with next row)	[3] 1,800 (with next row)
Hand-loaded conveyors—number of units	(2)	(2)	525	574	670	936	1,526	1,834		
Anthracite mines (Pennsylvania):										
Mobile loading machines	5	11	18	14	1	504 (with next row)	(4)	(4)	....	(4)
Scrapers	457	479	455	517	507		545	535	3	3
Pit-car loaders	28	24	19	25	22	1,790 (with next two rows)	....	[4] 1,997 (with next two rows)	....	....
Conveyors equipped with duckbills and other self-loading heads	1	17	12	13	30		[4] 1,831 (with next row)		[3] 189 (with next row)	[3] 331 (with next row)
Hand-loaded conveyors—number of units	547	818	940	1,338	1,563					

[1] Data for 1937 not available for bituminous mines. Minerals Yearbook 1939, page 857, shows 539 scrapers and 1,855 conveyors and pit-car loaders including a few mobile loaders in the anthracite mines for 1937.

[2] Number of units not reported in these years.

[3] Reported as face conveyors (hand-loaded), "shaker drives," and "duckbills." The figures of numbers sold in 1940 and 1941 are not exactly comparable with the number in use in 1939, because of uncertainties in defining what constitutes a conveyor and because of certain overlaps in the reporting of duckbill loading heads and shaker conveyors.

[4] Mobile loading machines included with conveyors and pit-car loaders.

TABLE 4—COMPARISON OF MOBILE LOADERS, SCRAPERS, AND CONVEYORS IN ACTUAL USE IN 1939 WITH SALES REPORTED IN 1940 AND 1941, BY REGIONS

	Mobile loaders			Scrapers			Conveyors [1]		
	In use in 1939	Sales in 1940	Sales in 1941	In use in 1939	Sales in 1940	Sales in 1941	In use in 1939	Sales in 1940	Sales in 1941
Bituminous									
Northern Appalachian States:									
Pennsylvania	213	94	80	30	7	4	526	225	237
Maryland	....	....	....	....	....	....	48	....	16
Ohio	91	23	31	....	1	....	50	178	145
Michigan	....	....	....	....	....	....	1	4	....
Southern Appalachian States:									
Alabama	16	6	22	45	10	....	193	54	142
Kentucky	68	18	37	3	....	....	161	134	212
Tennessee	8	....	2	....	....	....	62	26	[4] 49
West Virginia	331	59	107	7	18	4	586	724	712
Virginia	31	4	5	....	....	....	39	43	66
Middle Western States:									
Illinois	540	8	65	....	....	....	29	25	99
Indiana	138	7	8	....	....	....	26	22	2
Trans-Mississippi States [2]	137	14	10	46	....	....	672	138	120
Total bituminous	1,573	233	367	131	36	8	2,393	1,573	1,800
Anthracite									
Pennsylvania	(3)	....	1	535	3	3	[3] 1,997	189	330
Grand total	1,573	233	368	666	39	11	4,390	1,762	2,130

[1] Includes hand-loaded conveyors and conveyors equipped with duckbills or other self-loading heads.

[2] Includes Arkansas, Colorado, Iowa, Kansas, Montana, New Mexico, North Dakota, Oklahoma, Utah, Washington, Wyoming.

[3] Mobile loaders and pit-car loaders included with conveyors.

[4] Includes North Carolina.

1939. Pit-car loaders decreased from 3,428 in 1931, to 873 in 1939, or 74.5 percent. Sales of pit-car loaders in 1941 continued at a low rate, with 10 sales reported for the entire bituminous industry.

The first year for which data on both self-loading and hand-loading conveyors are available is 1933, when 657 machines were in use. In 1939 this had increased to 2,393. Sales in 1940 and 1941 were 1,573 and 1,800, or 41.0 percent greater than the total number in use in 1939.

Types of machines sold compared with units in use in anthracite mines.—The change in demand for different types of mechanical loading equipment for use in anthracite mines is also shown in Table 3. The total number of units of mechanized loading equipment in use at anthracite mines increased from 1,038 in 1931, to 2,532 in 1939. Detailed figures are shown for the years 1931 to 1935, inclusive, but certain items have had to be combined in other years to avoid disclosing individual operations. The total sales in 1940 and 1941 were 192 and 334, respectively, or 20.8 percent of the number in use in 1939.

Types of Equipment Purchased by Regions in 1941

Table 4 shows the number of mobile loaders, scrapers and conveyor

units shipped into various states and groups of states in 1940 and 1941, and the number of units in actual use in 1939. All except one of the 367 mobile loaders sold in 1941 were for use in bituminous mines. The largest number of these went to West Virginia, with Pennsylvania, Illinois, Kentucky, and Ohio following in the order named.

There were only 11 scraper units sold in 1941, 8 of which went to bituminous mines and 3 to anthracite mines.

The Southern Appalachian fields cntinued to be the largest market for conveyor units. In 1941, sales to the Southern Appalachian states of conveyors of all types including those equipped with duckbills amounted to 1,181, compared with 981 in 1940, an increase of 20.4 percent.

Sales of all types of conveyors in the Northern Appalachian states fell from 407 in 1940, to 398 in 1941, a decrease of 2.2 percent. The Trans-Mississippi states showed a decrease from 138 in 1940, to 120 in 1941. The middle western states showed an increase from 47 in 1940, to 101 in 1941.

Number of bituminous coal companies purchasing loading equipment in 1940 *and* 1941.—Table 5 shows that mechanization continued to spread to new fields and new companies in 1941. The number of bituminous coal mining companies using mobile loaders in 1939 and purchasers of this equipment in 1940 and 1941, by states, are also shown.

There were 231 companies using mobile loaders in 1939. Of the 83 companies buying mobile loaders in 1940, 56 had used them before, while 27 companies were installing them for the first time. In 1941, 22 new companies began using mobile loaders, and 99 bought additional equipment. The greatest number of companies purchasing mobile loaders for the first time in 1941 were located in West Virginia.

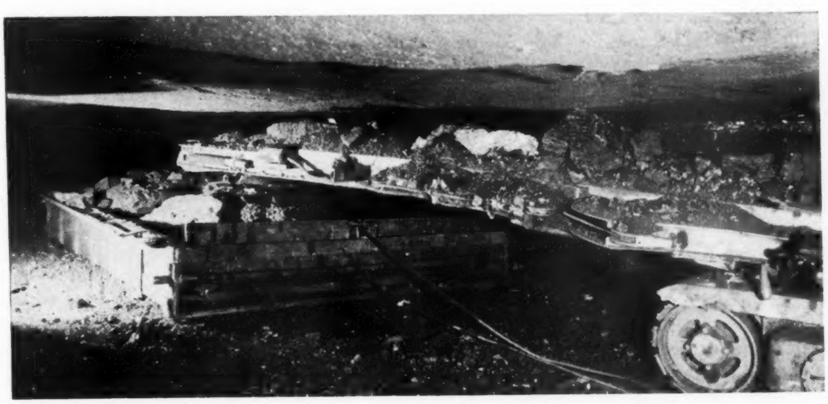
Data on sales of conveyor equipment are not sufficiently detailed to allow a separation between "former users" and "new users."

Trackless gathering equipment.—There were 204 installations of self-powered, rubber-tired trackless haulage units made in 1941, distributed over 10 states. West Virginia received the largest number, with Kentucky, Pennsylvania, Illinois, and Indiana following in the order named. These units are employed to haul the coal from the mobile loader to a transfer station located on the haulage way. They consist of a shuttle car or tractor-trailer which is propelled by a storage battery or cable-reel unit.

TABLE 5—Number of Bituminous Coal Mining Companies Using Mobile Loaders in 1939 and Number of Companies Purchasing Equipment in 1940 and 1941

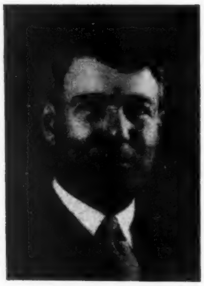
(Based upon records covering 84 percent of the total sales in 1940 and 89 percent in 1941)

	Users in 1939	Purchasers, 1940 Former users	Purchasers, 1940 New users	Purchasers, 1941 Former users	Purchasers, 1941 New users
Northern Appalachian States:					
Pennsylvania	28	16	6	21	3
Maryland	..	..	..	..	..
Ohio	14	2	4	8	1
Southern Appalachian States:					
West Virginia	61	15	9	31	7
Virginia	12	2	..	3	..
Kentucky	24	5	3	11	6
Tennessee	3	..	..	1	..
Alabama	6	1	2	7	1
Middle Western States:					
Illinois	38	4	..	8	3
Indiana	20	4	..	4	..
Trans-Mississippi States:					
Arkansas	1	..	..	..	..
Colorado	7	1	1	..	1
Iowa	..	..	1	..	..
Montana	5	1	1	1	..
New Mexico	2	1	..	1	..
North Dakota	..	..	..	..	..
Oklahoma	..	..	..	..	..
Utah	7	2	..	2	..
Washington	..	..	..	..	..
Wyoming	3	2	..	1	..
Total	231	56	27	99	22



SAFETY in Coal Mining

In the year 1941, as Mr. Evans points out, definite progress was made in rendering coal mines safer places to work. This was done despite a speed-up in production which brought forth over 502,000,000 tons of bituminous coal and over 52,000,000 tons of anthracite. Encouraging progress has been made in the cause of safety.



By CADWALLADER EVANS, JR.

Vice President and General Manager
The Hudson Coal Co.

ANY annual review written in January obviously cannot compare figures for the total year, because they are not yet available, but enough is known of the facts regarding safety in coal mining for 1941 to enable us to take comfort in the reduction in the loss of life due to major explosions in coal mines.

It is true that in 1941 there were 23 explosions, 7 of which were classed as major, i.e., ones which caused loss of 5 lives or more. The total loss of life from explosions was 78 men, very materially less than the 288 lives that were lost from explosions in 1940, but still far too high, particularly when compared with the figures from 1934 to 1937, which were 28, 54, 38 and 62.

The figure of 78 lives lost last year warns us that we must exercise increased vigilance lest the pressure for output due to war conditions lull us into ignoring the need for that sort of continual vigilance which produced the excellent records cited above for the period 1934 to 1937.

The preliminary figures which are available for loss of life due to causes other than explosions, indicate that the trend is still downward, despite the continuing introduction of more and more machinery into underground workings.

The increased use of high speed machinery obviously brings additional risks due to mechanical and electrical injuries, but it brings also a greater risk due to the increased speed at which excavations are made, and the increased speed at which gas may be released. The fact that this is so is being clearly realized, but it needs to be continually emphasized, particularly in mines where loading machinery is going in for the first time. In the old days of hand loading it might be days or even weeks before a room would be driven from one cross-cut to the proper location of another. Nowadays this same distance may be covered in a matter of a single 24-hour day. The additional burden on management to see that ventilation is properly kept up to the working face is, therefore, evident and is apparently becoming better understood.

The magnitude of the problem can be visualized when it is realized that the introduction of loading machines has continued in 1941 at an even higher rate than was noted in 1940, which means that there are now approximately 1,800 to 2,000 more units at work in the mines than there were a year ago, and that as a consequence the rate of advance of that many working places has been doubled or trebled or quadrupled, and that, therefore, there is a faster emission of gas in that many more working places, and greater need for vigilance in guarding against gas and in guarding against falls of roof from freshly opened roof spaces.

The latest figures available indicate

\+ + +

COAL MINING ACCIDENTS IN 1941

Tentative figures assembled by the United States Bureau of Mines place the number of fatal accidents in the coal mines of the United States for 1941 at 1,256, against a similar (final) figure of 1,388 in 1940.

The fatality rate per million tons of coal produced was (tentatively) 2.25, or by far the lowest fatality rate in the coal mines of the U. S. in the history of the industry in so far as statistical data are available. The lowest previous rates were those of 1939 (2.41), 1936 (2.73), 1933 (2.78), 1938 (2.79) and 1937 (2.83). The corresponding rate in 1906 was 5.27, in 1907 it was 6.78, in 1908 it was 5.97 and 1909 it was 5.73. This shows that the fatality rate in the coal mines of the U. S. in 1941 was almost exactly one-third that of 1907, or a reduction of 66 2/3 percent.

In addition to having the lowest fatality rate in coal mining in any year in the history of the industry in the U. S., the year 1941 had fewer fatalities from major explosion disasters, 73, than in any year in the past two decades (killed in major disasters in the coal mines of the United States), except in 1931, 1933, 1934, 1935, 1936, and 1939. The eight major coal mine explosion disasters in 1941 averaged only nine fatalities per disaster, the lowest average number of fatalities per major disaster in coal mining in the United States in any year, except the years 1933, 1935 and 1936. The anthracite mines of Pennsylvania, employing approximately 100,000 men, have the very excellent record of having avoided major disasters for more than 3½ years.

that in the bituminous field there has been a reduction in the fatality rates for accidents due to haulage and to electrical machinery, and in the anthracite region there has been a reduction in the accidents due to falls of roof and coal, to haulage, to electrical machinery, and to shafts, but there has unfortunately apparently been an increase in the number of fatalities due to use of explosives, both in the bituminous field and in the anthracite field.

It is not clear that this increase in explosive accidents is due to lessened vigilance on the part of the supervisory staff, but the fact that it has occurred puts us on notice to be on the lookout for a tendency to ignore the well known precautions as a reflex of the emergency conditions under which the industry is working, particularly the bituminous branch.

During the year the progress of safety education has been continuous. In the anthracite field this was manifest by increasing interest in the annual first aid meetings instituted a few years ago by the Pennsylvania Department of Mines, and carried on through a large number of first aid meetings, culminating in the regional meeting in Wilkes-Barre, from which teams were sent to the bituminous first aid meeting in Ebensburg. In the bituminous field the training of first aid teams has been continued and extended to include a number of mining communities as well as the mines themselves.

The coal dust hazard continues to receive increased attention in the bituminous field, largely on account of the explosion hazard—and in the anthracite field, largely on account of the question of respiratory diseases.

The conflict between rock dusting as a means of combating explosive hazards, and the desirability for maintaining a low silica content in the air on account of respiratory diseases, is one which has received attention during the past year, and will be more and more discussed in the future.

The use of permissible equipment continues to be urged by all of the governmental authorities who are responsible only for its introduction, and not for its maintenance.

The fact that permissible equipment is actually safer than open equipment only when it is kept in the same physical condition as when it left the manufacturer's shop, is being more clearly understood. The tendency to rely upon the permissible "plate" for safety is fortunately tending to disappear.

The year which has just closed has emphasized the necessity for continual alertness on the part of everyone connected with coal mining. The knowledge that there is a possibility of serious disaster if vigilance be relaxed for even one day, faces the coal mining industry constantly and is apparently being more and more appreciated as years pass. Every evidence seems to show that the intelligence and energy of the great majority of those connected with the industry are being devoted continually to the problem of reducing its inherent risks, and that progress is being made.

Progress in the ANTHRACITE Industry—1941

The anthracite industry in 1941 enjoyed the best production year since 1936 and, as the result of advances made during the year, is in an increasingly favorable position to fulfill vital functions in the country's war effort. Mr. Lesser gives an excellent over-all view of the progress made during the past year.

By W. H. LESSER
Pierce Management

FEAR of a coal shortage resulted in a mid-summer tonnage of such magnitude that operating managers were hopeful of a very prosperous year. Mild weather during the last quarter so reduced operating time that the year ended with a commercial production of 52,400,000 net tons, an increase of just about 7 percent over 1940. Table I shows the trend in production.

Shipments to Canada and New England show an increase over the past year. Canadian shipments were up 540,000 net tons.

TABLE I

Year	*Commercial Production—Net Tons*
1920	79,740,000
1926	78,000,000
1930	64,346,000
1935	49,412,000
1940	49,229,000
1941 (estimated)	52,400,000

Industry Establishes Production Control Plan

So unprofitable was the industry in 1939 and early 1940 that the Anthracite Emergency Committee was organized to administer a voluntary production control plan which was agreed to by mining companies producing 95 percent of the annual output, the United Mine Workers and representatives of the Commonwealth of Pennsylvania. The object of the plan was to prevent overproduction by allocating to each mine a production quota based upon a weekly estimated total industry demand. After a successful trial period the plan was legalized on July 7 by the Governor of the Commonwealth when he signed a bill passed by the legislature author-

izing the Department of Commerce to promulgate such voluntary plans in the interest of business promotion.

Bootlegging Problem Controlled

The production of bootleg coal is not only a competitor of legitimate coal mining companies, but a social problem as well; since it employs many men who otherwise would be on relief rolls. A proper approach to its solution was made early in the year when the Anthracite Emergency Committee authorized a comprehensive report on the bootleg industry which showed 12,000 men employed in 2,900 holes, producing five million tons of coal per year, prepared in 340 breakers.

Soon after the report was analyzed, legitimate coal mining companies agreed to buy bootleg coal and prepare it in their breakers. This action accomplished these important results: the coal reached consuming markets through regular sales channels, bootleg miners were insured a fair price for their output, and many operators got a needed tonnage without an expensive mine development long delayed on account of a lack of funds. The plan also contemplated the following: No new holes were to be opened when existing holes are mined to exhaustion, and the men then without work were to be employed by legitimate mining companies.

Efforts were made to close certain bootleg holes, but serious resistance developed which will, no doubt, preclude future similar action.

A forecast regarding the life of the bootleg mining industry is difficult to make. However, this is true; the exhaustion of the easily mined coal in outcrops, together with a labor shortage, and high mining costs will eventually make the industry unprofitable.

Mine Mechanization Progresses

To maintain an annual production of around fifty million tons, an investment of about twenty million dollars is necessary for mine development consisting of rock and coal gangways, tunnels, airways, new levels, and shafts. Here is an expenditure of sufficient magnitude to warrant consideration of ways and means to reduce it. Tunnel driving costs can be kept at a minimum through the use of tunnel rock loading machines. And six Conway loaders, bought in 1941, indicate the urge to speed up tunnel driving at a low cost.

Coal mining, especially in the flat thin seams of the Northern Field, involves the use of coal cutters, shaking conveyors, belt conveyors, scraper loaders, and chain conveyors; each machine has a place where it performs most efficiently. According to reports from manufacturers, the shaking conveyor was the most popular loading machine sold during the year with chain conveyors second on the list. The increase in coal mechanically loaded during the past is shown in Table II.

TABLE II

COAL MECHANICALLY LOADED UNDERGROUND

Year	Net tons
1927	2,223,000
1930	4,468,000
1935	9,279,000
1939	11,774,000
1940	12,326,000

A large operating company reports that in 1932, 41 percent of its output was loaded mechanically, while in 1940, this record increased to 84 percent.

Activity continues in reopening abandoned mines. Stockton No. 3 Colliery was rehabilitated by the Jeddo-Highland Coal Company after being idle since 1902. Pine Hill Coal Company will soon start mining the extensive Pine Knot Basin. The Edison Anthracite Coal Company completed the sinking of its No. 3 shaft to a new level which will make available for mining a large tonnage of virgin coal.

Ventilation Surveys Lead to Increased Efficiency

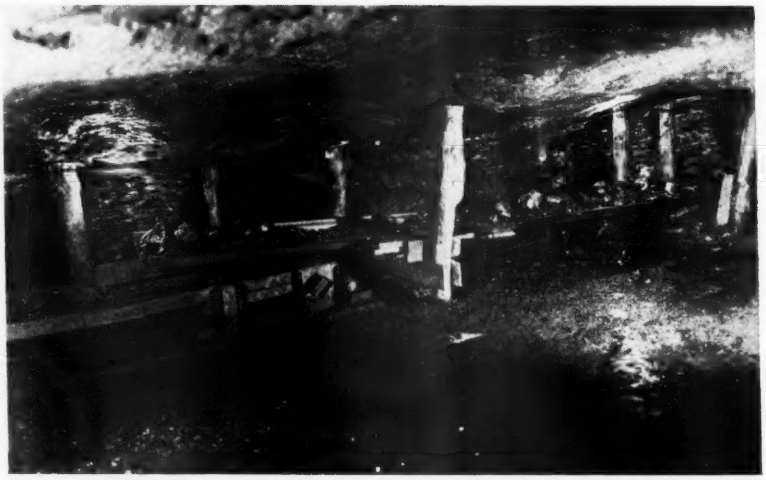
Studies of ventilating systems in old mines are being made with surprising results as to air leakage and inefficient fans. They have convinced the forward executive to revamp his airways, and purchase fans guaranteeing power economies sufficient to pay the necessary investment in an astonishingly short period of time. A modern 7-ft. mine fan with adjustable pitch blades will produce 225,000 cu. ft. of air per minute at a 5-in. water gauge and a ventilating efficiency of 74 percent.

Stripping Operations Active

Stripping operations are more active than ever, especially in the Southern Field where outcrops on heavy dips lend themselves to this class of mining. New operations are made possible on account of more thorough prospecting by engineers whose recommendations are confirmed by many proving holes provided by bootleg miners. So great is the demand for stripping coal that illuminated booms visible from highways in seemingly inaccessible locations indicate the necessity for operating shovels on overburden during the night.

Larger shovels, Walker dragline equipment, and 10-ton trucks make it profitable to strip coal which, during the past, was considered impossible. Even heavy rock overburden, and first-mined coal seem not to discourage the enterprising contractor.

An example of the trend in strip-



Discharge end of a shaking chute, feeding a belt conveyor, Pennsylvania anthracite mine

ping projects is that of the Central Pennsylvania Quarry Stripping and Construction Company in a Jeddo-Highland stripping near Hazleton, Pa., the birthplace of strip-mining in the anthracite area. The foregoing project will consist in moving one million yards of material placed over the coal during a previous stripping operation, and two and a half million yards of clay and rock. Clay will average 15 ft. in thickness and rock 70 ft. In some areas a rock cover of 100 ft. is anticipated. About two-thirds of the material will be cast, and of this, approximately one-third must be handled twice. Rock holes for blasting purposes 9 in. diameter on 15 by 20-ft. spacing are drilled by blast-hole drills, while well drills are used to drill 6-in. holes on 12 by 15-ft. spacing. Ten-ton back-dump trucks do the hauling.

The coal lies in a series of folds with definite synclines and anticlines without any degree of regularity as to thickness or pitch. Its normal thickness is 25 ft.

A Walker dragline shovel with an 8-yd. bucket and a 200-ft. boom does the principal excavation. Electric power at 2,200 volts operates a 450-kw. motor generator set for the purpose of supplying direct current to the motors. The hoist and swing motors have a rating of 250 and 75 hp. respectively.

These tonnage records, Table III, show how anthracite stripping operations have increased:

TABLE III

Year	Tons mined by strippings
1920	2,000,000
1930	2,526,000
1939	5,486,000
1940	6,353,000

Drainage Tunnels Help Solve Water Problems

Some coal mine executives are faced with mine pumping costs so high that they affect importantly the economical operation of their properties. The contributing causes for this situation are: certain mines are obliged to handle the water from abandoned adjacent properties because barrier pillars are not solid, bootleg mining has increased the water inlets to mines, and drainage ditches have been rendered useless.

It now costs the industry about eight million dollars annually to keep the mines free from water, or around 16 cents per ton. During the period extending from 1927 to 1935, the tons of water pumped per ton of coal mined increased from 19.5 to 29.3 tons; and further increases are anticipated. Under conditions such as these, heavy investments in mine pumping plants are necessary. A plant of more than ordinary importance contains motors with a total rating of 3,000 hp. driving pumps having a capacity of 19,500 gallons per minute against a head of 600 ft.

Extensive drainage tunnels have been proposed to help solve the pumping problem in the Southern Field. One proposal contemplates a tunnel 22 miles long between Herndon on the Susquehanna River and the Mount Carmel area, while another will extend for an equal distance from Shoemakersville on the Schuylkill River to the Shenandoah area. Surveys regarding the economics of the foregoing projects are necessary to determine their value through a long future period of mining. Existing drainage tunnels, notably the Jeddo Tunnel, have demonstrated beyond a doubt their advisability under certain conditions and during periods of high water.

A pumping problem of interest confronted the Pine Hill Coal Company when it started to dewater the Pine Knot Basin; a preliminary step to mining coal in Pine Knot Colliery. It was solved by placing two 4,000-gallon pumps on the shaft cage which was supported at each corner by a chain hoist arranged to drop the cage each time the water was lowered 20 ft.

New Preparation Plants Added

Even though the industry in 1941 experienced a lack of funds for improvements, some were available for investments in new breakers, and the installation of modern cleaning equipment in old breakers. Many of the latter expenditures were made for the purpose of cleaning the smaller sizes, now finding a more extended market where, however, the ash content requirements are so exacting as to make such installations mandatory.

Breakers have been built, and there is a tendency to build plants incorporating a combination of two generally accepted cleaning processes; one process treats the larger sizes and the other the smaller sizes.

No marked improvements have been made in anthracite coal cleaning processes, but design changes in the equipment have helped to improve in general its operation. There is a trend towards the use of larger shakers especially in installations designed to size and dewater the smaller sizes. Here also, high-speed and vibrating shakers have been applied. Sizing a product minus $\frac{3}{64}$ in. presents a problem, and classification by upward flowing currents of water is helping to solve it.

Research work, relative to cleaning coal, is conducted quietly though consistently. One class of this work has as its object the ash reduction in No. 5 Buckwheat by the use of froth flotation.

Of course, the activity in coal cleaning during the year can be measured only by the equipment installed. Cleaning equipment with a total feed capacity of 4,594 net tons per hour has been placed in operation, as follows:

Type	No.	Feed capacity, tons per hr.
Wilmot Hydrotators	19	1,225
Wilmot Classifiers	6	345
Wilmot Simplex Jigs	6	240
Chance Cones	10	1,425
Menzie Cones	18	1,122
Diester Super-duty diagonal deck tables	21	237
Total		4,594

Eight new cleaning plants have been placed in operation with a total capacity of 1,176 shipped tons per hour.

Sustaining Activities Aid Industry

There has been organized the Technical Advisory Board of the Anthracite Industry for the purpose of promoting advances in the technology of product utilization—a link between product preparation and marketing. Much of value to the industry is expected from the organization, since it contains men who have made outstanding contributions to the technique of fuel utilization.

The Fourth Annual Anthracite Conference of Lehigh University was held in May at which 17 papers were read relative to increasing the use of anthracite. A valuable public and technical interest has been stimulated by the conference, especially through the wide distribution of printed transactions.

President Roosevelt signed a resolution passed by Congress creating a commission "to investigate ways and means for improving economic conditions in the anthracite coal producing areas of the United States." Seven members will constitute the commission: two members of the Senate, two of the House, and three others—

United States Bureau of Mines, National Resources Board and the I. C. C.

Research as provided by the Williams-Kenehan Bill of the Pennsylvania State Assembly is conducted by State College. An interesting problem regarding the use of anthracite in foundry cupolas has been referred to that organization. Bulletin 32 is now available showing the results obtained when using anthracite and heavy-oil in making water-gas.

Anthracite Industries, Incorporated

Continues its valuable activity concerning the utilization of anthracite. Now it is cooperating with the USHA in the development of a heating plant to suit small, and removable houses. Grates have been designed to replace oil burners on a large scale when and if an oil shortage makes such action necessary. The combustion of coal is studied by means of photographing active fires in a manner that burning periods of long duration may be viewed in a few minutes.

And the Anthracite Institute, in addition to carrying on its usual information service, opposed extensions of natural-gas pipe lines into eastern markets and hydroelectric projects; both competitors of anthracite.

Safety Programs Accomplish Results

On May 7, the Congress of the United States passed an Act authorizing the federal inspection of coal mines. Federal inspectors will, therefore, visit anthracite mines for the purpose of making them more safe. Interest in "safer mining" has increased since regional first-aid contests have been held. The winners in these contests compete in a general contest of anthracite and bituminous teams.

The Midvalley Mine of the Hazle Brook Coal Company holds the record for safe mining in 1940 with 305,547 man hours worked at a severity rate of 0.861 and for that reason it was awarded the trophy of the National Safety Competition. Twenty-four men in the Hudson Coal Company were given certificates of honor by the Joseph A. Holmes Safety Association. One miner was mentioned for having an outstanding safe record. To stimulate ideas concerning safety, the Locust Coal Company gives a prize to those men who submit a meritorious safety suggestion or slogan.

Statistics regarding fatal accidents up to November 30, 1941, were:

Year	Production per fatal accident
1935	192,356
1936	225,162
1937	245,025
1938	207,038
1939	238,008
1940	277,045
1941 to November 30, 1941	277,429

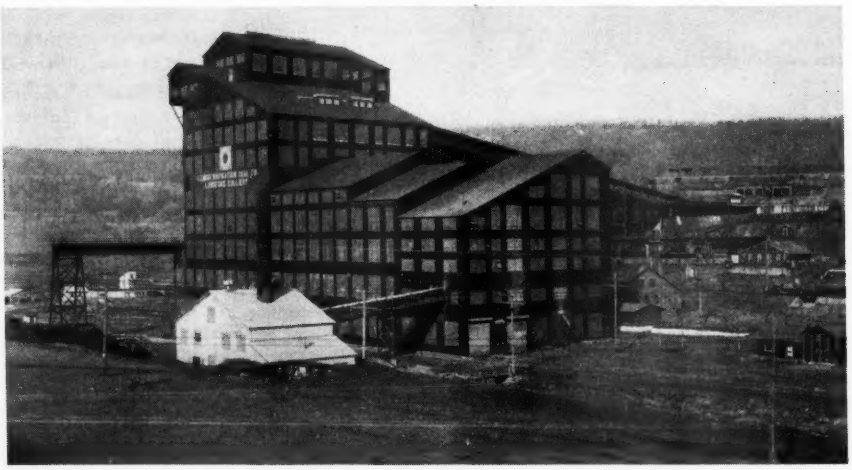
Employers realize their men must be "Safety Conscious" in order to make safer mines, so the Hudson Coal Company gives to workers thus qualified a "Safe Workman" button which is pinned to their working caps.

Personnel Training Attracts Men

Some study has been given to maintaining company personnel, and this is as it should be, if future management is to function successfully. As a result, the Hudson Coal Company is cooperating with State College in conducting classes which are attended by many Hudson employes. The Lehigh Navigation Coal Company awards scholarships to promising young men from its mining area. Actions such as these will help to attract young, trained men to the industry who for several past years have entered other fields of business activity.

The Industry Will Meet the War Emergency

Operating profits during the year 1941, like those of the past decade, have precluded extensive investments in plant improvements; but they will eventuate on a scale comparable with those of the great industries of the nation, when and if the sales realization and working time improve. And as to the future, the industry is confident of meeting the demands that may develop during the present national emergency, even to the extent of increasing the production very materially.



A modern anthracite breaker

Metal Mining—Developments in DRILLING, BLASTING and STOPING

Mr. Eaton draws upon his wide experience in the practical application of modern mining methods, and his broad knowledge of mining developments, to give here an up-to-the-minute review of interest to all mining men.

By LUCIEN EATON
Consulting Engineer
Milton, Mass.

RADICAL changes in methods of mining in the past few years have been relatively few. There has been a general improvement in practice and in unit production. Most of the changes have been at the larger mines along the line of greater use of mechanical equipment in stopes and more rapid extraction of ore.

Deeper Rounds and Larger Blasts Employed

In mines where the ore is loaded mechanically in the stope, as in breast stoping, the trend has been toward deeper rounds and larger blasts, thus minimizing the amount of cleaning up. In other systems of open stoping, where the ore falls into chutes, such as sublevel stoping and shrinkage stoping, larger blasts are also the rule. This increase in the size of the blast has been accomplished in various ways:

(1) The size of the face and the depth of the round have been increased.

(2) Two or more rounds are shot between loading cycles.

(3) Longer holes with heavier burdens are used, and more attention is paid to drilling the holes as nearly parallel to the face as possible.

(4) In sublevel stoping, ring-drilling, i.e., drilling radial holes from a sublevel drift, has been substituted for drilling vertical holes up and down from a bench.

(5) In sublevel stoping long vertical holes are drilled by diamond drills, only one sublevel being used to mine the full height of the stope.

As an example of increasing the size and depth of the rounds blasted the mines using top-slicing in the Lake Superior Iron Districts may be cited. In these mines both the sublevel interval and the width of individual slices has been increased. The length of legs and caps was increased first to 7 feet, then to 8 feet and again to 9 feet, and it seems probable that legs at least may be lengthened again. The result has been an increase in sublevel interval from 10 feet to 13 feet and even 14 feet. Wire fencing on top of poles or lagging is used in covering floors and as gob walls. The use of this fencing and of longer poles in covering floors and the quick removal of broken ore by scraper has made it safe to shoot longer rounds and to increase the distance between sets. More rapid ore extraction has made it economical to increase the area mined from each chute. Chutes are 60 feet or more apart, and ore is mined for 100 feet to 125 feet on each side of the chute.

Practice Improved at Eastern Iron Mines

In the second category come the iron mines at Birmingham, Ala. In these mines the ore is 8-ft. to 15-ft. thick and dips at a flat angle, and levels were originally 65-ft. apart measured on the dip, breast stopes being driven along the foot-wall. When scrapers were introduced for loading, the mining system was changed. Stopes are now driven up the foot-wall, and the level interval has been increased to 250 feet or 300 feet. The capacity of the scrapers is so large that each face is drilled and blasted two or three times before it is cleaned out, the dip being just sufficient to clear the face after each round. One loading outfit serves three to five rooms.

Practice at the Scrub Oaks Mine at Dover, N. J., is an example of long, flat holes carrying heavy burdens. The ore is mined in wide shrinkage stopes, and drilling is done with jackhammers mounted on air-feed legs. The drill lies on a piece of 2-in. plank supported at one end by a short ladder. The first cut is taken out near the foot-wall, and then long holes are drilled from it towards the hanging-wall. Holes are 3-ft. to 6-ft. apart, and usually carry a burden of 6 feet. Although the ore is tough and strong, powder consumption is very low, about four tons of ore being broken per pound of powder.

Methods Improved at Canadian Mines

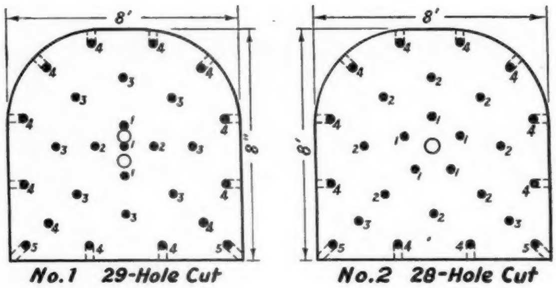
Ring-drilling in sublevel stoping was used at Mt. Isa in Queensland[1] and at Noranda in Quebec[2]. At Mt. Isa one or two large sublevel drifts, depending on the width of the stope, were driven on each sublevel parallel to the axis of the stope. In each drift radial holes were drilled all around the periphery in planes 4-ft. to 5-ft. apart, normal to the axis of the drift. The footage drilled is 244-ft. to 247-ft. per round, and the burden is 1.2 tons to 1.6 tons per foot of holes. Drilling is done with drifters and reverse-feed stopers. Powder consumption including secondary blasting is .43 pound per ton.

At Noranda two drifts were driven on each sublevel, one along each side of the stope. Stopes were 75 ft. wide and the sublevel interval was 35

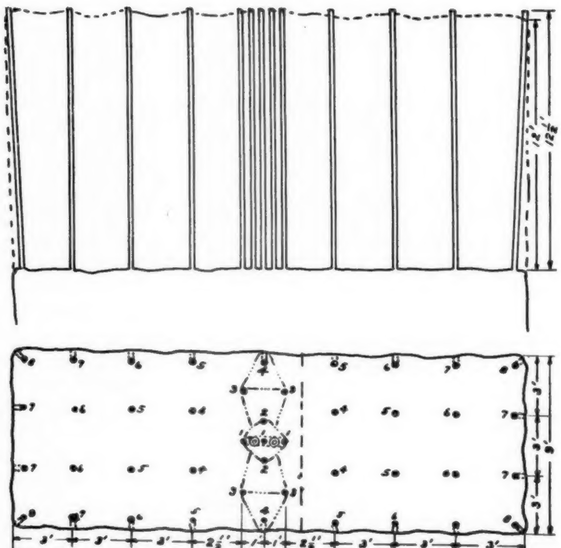
[1] I. C. 6978, U. S. Bureau of Mines.

[2] Diamond Drills for Stoping by Fred S. Dunn, E. and M. J., Vol. 140, No. 1, p. 38.

ft. Radial holes up to 20 ft. deep were drilled toward the center of the stope in planes 5 ft. to 6 ft. apart normal to the axis of the stope. The holes were drilled with mounted drifters using sectionalized steel. Diamond drills were later substituted for the drifters, and the sublevel interval was increased to 60 ft., the width of the stope to 105 ft. and the depth of the holes to 65 ft. Because long holes drilled upwards are hard to load, most of the holes are drilled downwards, the maximum upward angle being 15° above the horizontal.



Two types of burn-out cut. Numbers show order of firing. Holes shown in outline are not fired



Numbers show order of firing. Holes not fired ◎

BURN-OUT CUT in Breast Stope 9 Ft. High

In higher stopes this would be the breast cut. The bench would be drilled in the usual way.

The diamond drills are of the light prospector type, electrically driven, and use $1\frac{1}{16}$-in. rods in 5 ft. lengths and $1\frac{3}{16}$-in. coreless bits. Faster drilling is done with the non-coring bits, because pulling rods to remove core is eliminated. The bits used are mechanically set, using small pieces of bortz in a matrix of tungsten carbide and cobalt, and, when dull, are sharpened by a sand-blast, which removes enough of the matrix to provide the necessary clearance. The drills average 37 ft. of hole per drill-shift, and their advantage over rock-drills using sectionalized steel is most evident in hard ground.

Blasting is done by a special crew on Saturday nights. Detonation is electric. In loading the deep holes the blasters use as a tamping rod an ordinary garden hose stiffened by a $\frac{3}{8}$-in. wire rope, to which is attached a brass tube filled with lead. Powder efficiency is high, the burden being 4 to 6 tons per pound of powder. Large blasts are common, the usual tonnage broken being 3,000 to 10,000 tons.

At Aldermac,[3] Quebec, diamond drills were so successful in mining stope-backs and floor pillars that they were later used in sublevel stoping. The stope is opened in the usual way, chutes being belled out into hoppers underneath the ore to be mined and a stoping-raise being widened to form a slot across one end. Only one sublevel is driven, and that is the top one just under the floor pillar of the level above. The room is 60 ft. wide and the bench under the sublevel is 140 ft. high. A side-cut is "slashed" out across the room on one side of the stoping slot, and vertical diamond drill holes $1\frac{9}{16}$-in. in diameter and 137 ft. deep are put down in the bench thus formed. The holes are 6 ft. apart in the row and carry a burden of 6 ft. They are loaded with 40 per-cent powder, and are detonated with Primacord. Fragmentation is excellent, and both powder and drill-hole efficiency are good, 4.4 tons being broken per foot of hole and 5 tons per pound of powder. Drill holes cost approximately 50c per foot, and the total direct cost of breaking ore is between 15c and 20c per ton. At this mine the bits are hand set, using very small chips of carbon.

A new and successful method of mining was put into use a few years ago at the Beatty mine near Noranda, Quebec. Here there is a wide vein of very hard ore standing nearly vertically. Below the outcrop ore, which could be mined in glory holes only during the summer months, about a million tons of ore was prepared for underground mining. A cross-cut was driven from the shaft to the vein, and a crusher station with a pocket above it was cut in the ore at the end of the cross-cut, and a jaw-crusher was installed. From the top of the pocket above the crusher large raises were driven both ways in the vein at a slope of about 45°, and from them branch raises were driven at proper intervals for room-and-pillar mining. Rooms were opened at the tops of these branch raises, and the ore was stoped directly into the chutes, passing by gravity to the crusher. The crushed ore was carried to a pocket at the shaft by a belt conveyor.

Mining Practice Adapted to Special Conditions

These examples illustrate some of the things that have been done in recent years to improve mining practice, especially in hard ore. They are all in large mines, and most of them are in wholesale mining of relatively lean ore, and their aim has been large production at low cost. In other mines the trend has been towards clean mining and careful selection, the prime object being complete extraction and a high-grade product rather than a low cost per ton. As a result in fairly narrow veins with weak walls, a change from shrinkage stoping to cut-

[3] A Mining Method for Large Ore Bodies, by A. V. Corlett and G. D. McLeod. Trans. Can. Inst. of M. and M. Vol 43, 1940.

and-fill has been in progress for a number of years.

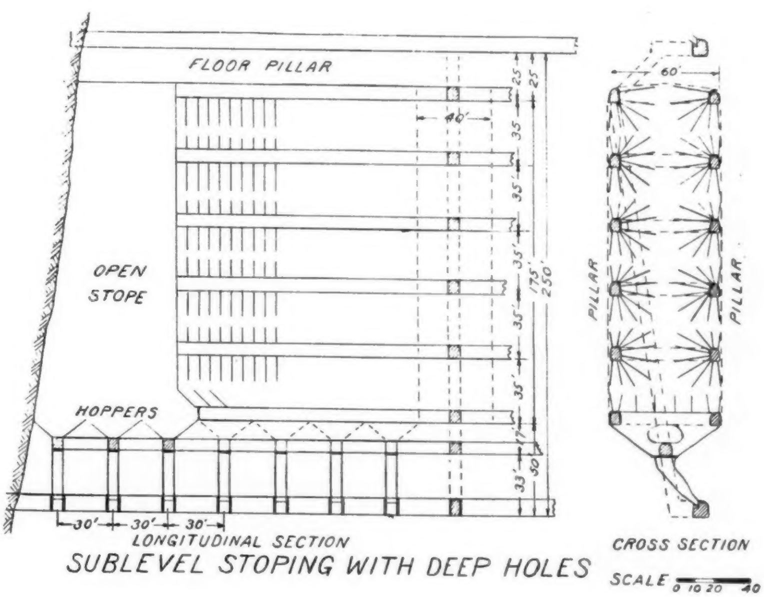
Some fortunate mines have both rich ore and large ore bodies. With them complete extraction and a clean product are of first importance, and square-set mining either alone or in combination with some other cheaper system is often employed. Although square sets were invented 75 years ago, improvements in their use are still being made. There are apparently two schools of thought in square-set mining. One prefers high narrow rooms, which are mined partly underhand by the Mitchell slice variation of square setting. The other school prefers long flat rooms, which are worked upwards in successive horizontal slices. Two tiers only are kept open, the tiers below being filled. All the drilling is done on the top tier, horizontal holes being used to break the ore down to the tramming pier below. An innovation is a single row of standard sets put up on the center line of the room, and long caps reaching from these center sets to the edge of the room. These long caps are recovered in whole or in part, when the tier is filled.

Secondary Mechanical Transport Is Employed

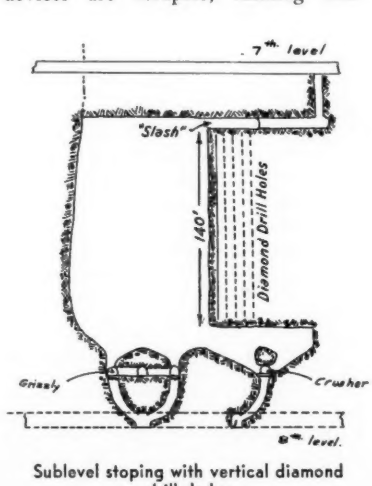
In other systems of mining, notably undercut caving, what might be termed secondary mechanical transport has affected both mine lay-out and stoping practice. By secondary mechanical transport I mean devices for transferring ore on intermediate levels in order to reduce the height or number of raises or the amount of main level development or stope preparation. The most important of these devices are scrapers, shaking conveyors and belt conveyors. Shuttle cars promise to perform a similar service in mining large flat deposits by open stopes.

Scrapers are widely used for transferring ore on sublevels. They have effected marked economies in both main and sublevel development, but their range is limited. Only the very large scrapers are efficient for distances over 200 ft., and even the large scrapers seldom are used for hauls of more than 300 ft.

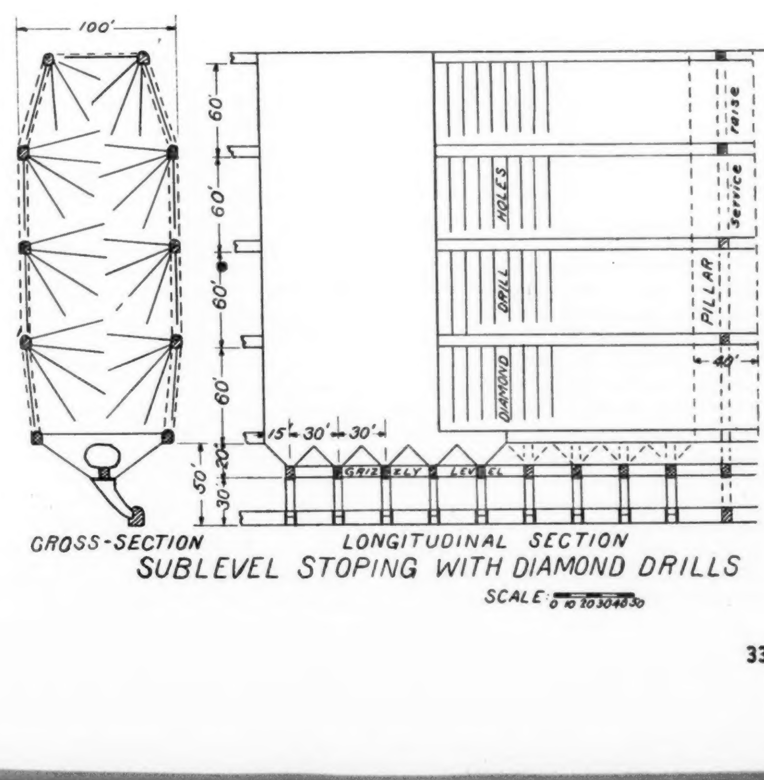
Shaking conveyors work successfully on coal, and are being tried in metal mining with some success. They work most effectively with dry, relatively fine ore in places where there is a grade in favor of the load. They will not handle wet and sticky ore, and their capacity is small on adverse grades. As transfer agents on light down grades that are too steep for cars and too long or too crooked for scrapers they have an ideal application.



SUBLEVEL STOPING WITH DEEP HOLES



Sublevel stoping with vertical diamond drill holes



SUBLEVEL STOPING WITH DIAMOND DRILLS

Belt Conveyors Have Field of Application

Belt conveyors will handle wet and sticky ores, usually at the cost of higher maintenance, but are not suitable for coarse ore. Chunks should not be larger than one-third of the width of the belt and should constitute not more than 10 percent of the load. The use of a belt conveyor for moving hard ore, except under unusual conditions, requires excessive secondary breaking in the stope. Belt conveyors have, however, one decided advantage over almost all other forms of transport in that they work with the same capacity on all slopes, both favorable and adverse, that are less than 22°, and hence have a field as secondary transport in mining ore below an established level in deposits of less than 22° dip, or in following beds of irregular dip.

In some of the mines of the Tri-State District scrapers are used for loading ore into hoppers over belt conveyors, which carry it to the shaft. The economy and the increased unit production made possible by the conveyor have resulted in greater concentration of effort and lower costs, and have permitted more selective mining and improvement in ore analysis.

It has been predicted that shafts and hoists will be superseded by inclines equipped with belt conveyors. There are conditions under which this may well happen, but the practice will never become general. The slope in which the conveyor will run will be at least 2½ times as long as the shaft is deep, and the ore will have to be crushed underground. The main argument against the scheme is, however, that a shaft would have to be sunk anyway for handling men and supplies. Nevertheless the scheme has much to be said in its favor, if conditions are right.

Drilling Has Been Speeded Up

The speed of drilling has been nearly doubled partly by improvements in the drills and partly by those in the steel. Detachable bits are now widely used, and both their design and the method of sharpening them have been improved. In large installations hot millers instead of grinders are used for sharpening, but grinders are more common at small plants. As a result of more precise sharpening and better bit design gauge changes have been reduced with a consequent reduction in the diameter of starters and a proportional increase in drilling speed.

A corresponding decrease has not been made in the time lost when the drill is not hitting the steel. Automatic feeds on drifters cut down the time lost in changing steel, and in big drifts and tunnels "jumbos" cut down the time required for setting up. But in stoping there has been little improvement. Hydraulic columns are used to some extent, but they are expensive, and have not met with general favor. Careful records have shown that in stoping only in exceptional cases is the hammer hitting the steel as much as 40 percent of the shift, and the average is nearer 25 percent. Allowing for time out for changing steel, a saving of 20 minutes in the time required for setting up and tearing down is equivalent to a 10 percent increase in drilling speed, and is well worth going after.

Increased Production Per Working Place Is To Be Expected

If we are to judge the future by the past, we cannot expect that any radical changes in present methods of stoping will become general in the near future. One line of progress, however, I expect to see followed pretty generally, and that is a general increase in production per working place. Larger rounds will be fired oftener, and stopes will be worked out in a shorter time. Faster drilling and loading machinery have shortened the time necessary for stope preparation, secondary mechanical transport has reduced the amount of development needed, and production in the stope will be stepped up to keep pace.

One of the ways in which unit stope production will be increased will be by deeper rounds, especially in breast stoping and slicing, and by the simultaneous blasting of a larger number of holes. In drifting, raising and shaft sinking long cuts can be pulled by using the "Michigan burn-out" cut, and 12-ft. rounds are regularly pulled in 8-ft. drifts. This cut has been adopted as standard for development headings by many of the progressive large companies. It can easily be adapted to stoping with beneficial results. Its successful application should be made more sure by using Primacord, the new detonating fuse made by the Ensign Bickford Co., for detonating the cut holes.

Practice At Small Mines May Also Be Improved

The discussion up to this point has dealt almost entirely with large mines and large deposits. At small mines many of the changes in practice that have been successful in large mines are not applicable, partly because of physical conditions underground and partly because the necessary capital is either not available or its expenditure is not warranted by the amount of ore in sight.

Although small mines cannot be expected to get as good results as large mines, they can often do remarkably well by concentration of work, thereby obtaining a good production from a small number of working places. Often small mines that cannot afford the capital expenditures necessary for economical working when worked independently, can do very well when combined under one ownership or when delivering their product to a central treatment plant. If equipped with self-contained machinery that is easily moved from one mine to another, they can be worked successively, one mine being developed while another is being worked out, and intensive methods of mining can be used that produce a reasonably large tonnage from a small area. By these means they can be worked without excessive overhead or capital investment, and results can be obtained approaching those of much larger operations. Some of our greatest mines obtain their large output by combining the production from a large number of small stopes, and the same procedure, if applied to a number of small mines, will give comparable results, if efficient transportation is available.

The crudity and inefficiency of many of our early mining operations were due as much to lack of capital as to lack of knowledge. The capital expenditure per man employed in a well equipped mine is at present somewhere between $5,000 and $10,000, and averages probably about $7,000. We cannot expect modern results without such an expenditure, and few small mines can afford to spend so much money. Whether or not this rate of capital expense will continue to increase is a moot question. It is fostered by a high wage-scale, but artificial limitations of output per man will check it, and exhaustion of capital as a result of the present war may cause it to decline.

The Colorado School of Mines and the University of Colorado were each recipients of a $100,000 bequest from the estate of the late Simon Guggenheim, president of the American Smelting & Refining Company, according to the terms of the will which was recently filed.

THE METALS AT WAR—

• In after years, the present world conflict may well be known as the War of Metals. It is a war of supplies and sources of supply of minerals, and it is also being fought, to a far greater extent than ever before, with metallic weapons.

The following reviews give a comprehensive picture, within the limits of good public policy, of the present status of our major metal and nonmetallic mineral supplies, and of the extent that we are prepared, in regard to these supplies, to wage to a successful conclusion The War of Metals.

The Outlook for ZINC

By **WALLACE G. WOOLF**
Superintendent
Electrolytic Zinc Plant
Sullivan Mining Co.

THE zinc industry was among the first of numerous others producing materials vital to our war efforts to begin the hard struggle against the implication of the dread phrase "too little and too late."

In this war as in World War I, the Axis has taken possession of the important sources of the European zinc production, and this country has to augment the supply for the anti-Axis nations, thus intensifying the need for increased domestic output.

It is estimated that the total 1941 production of zinc in the United States including metal imported from Mexico was 914,000 tons.

Consumption Has Risen Enormously

Consumption figures are difficult to estimate. Increased war needs will be adjusted by a sharp reduction in civilian uses. The additional adjustment in consumption to equalize the production will not be difficult, it is thought, unless greatly increased war requirements or substantial curtailment in production of allied countries seriously change the outlook. The countries supplying the imported concentrates in 1941 were Mexico, Canada, South America, Newfoundland and Australia. Lack of cargo space and increased hazards of ocean shipping can seriously reduce an important portion of this supply, thus stressing the need for an increased output of domestic zinc concentrates.

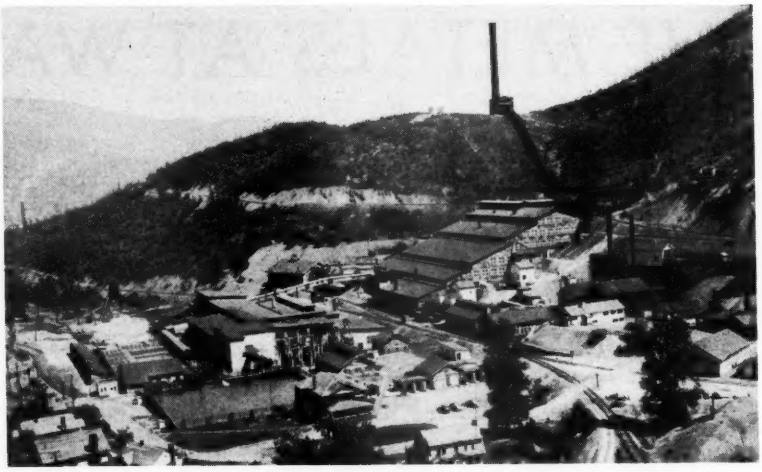
It is estimated that the increased production schedules of mines now in effect will increase the supply of zinc concentrates as much as 10 percent above that of 1941. Curtailment of imports would increasingly necessitate that we utilize the output of all marginal, small and higher-cost properties, and bring into production new and lower-grade ore bodies.

Increase in Price Stimulated Marginal Production

Fortunately, throughout the depression years, the domestic zinc industry struggled to keep its mines and metallurgical plants geared to supply domestic requirements, accommodating itself to increasing competition from foreign producers, which competition was further intensified at the beginning of 1939 by a 20 percent reduction in the tariff on zinc. The war effort starting in September of that year overcame these difficulties; the greatly accentuated and vital demand kept zinc enterprises in operation that otherwise would not now be prepared to meet the present supreme test of productivity. A further assistance was the increase of 1 cent per pound in the ceiling price of zinc (to 8.25 cents) and it is hoped that the ceiling price for lead will likewise be increased to stimulate the production from marginal lead-zinc mines. At best, the zinc industry was in none too good a position to make its proper contribution to the war effort but although it will take all its resources, technical skills and background of experience, it will accomplish that task.

World War I brought an intensified realization that underlying the political rivalries ofttimes resulting in war are basic economic factors among which is the control of strategic mineral resources, not widely distributed in important quantities but vital for modern armaments. Included among the aims of the historic Atlantic Charter is the point that the essential raw materials of the world must be opened up to all nations. But, while international economic cooperation is its ultimate objective, there has been

stressed the continued arming of Great Britain and the United States as a means of assurance against aggressive wars. To accomplish this, we must have within the confines of our country the ability to produce the necessary raw materials wherewith to fabricate the "arsenal of democracy." Self-sufficiency insofar as possible becomes a measure of national safety. Thus, as concerns the critical metal zinc, we should have reduction plants and developed mines sufficient to supply our war needs. No one will now deny that the proper time to develop adequate resources of ores needed for war purposes is in time of peace.


Zinc plant, Bunker Hill and Sullivan Mining and Concentrating Co.

To Prepare for War, Zinc Industry Must Be Developed in Peace-Time

What is in store for an expanded domestic zinc industry after this war? In the dim future, in a happier world, it may be possible to organize a world industry on a world basis. But when this war is won we may lose everything we are fighting to attain if in the transition to peace the government's pre-war policy tending toward free trade is continued. Any proposals for free trade touch our domestic zinc industry where it hurts. It must have adequate protection, since the sources of zinc production in the United States are below the world average grade, and cost of production is higher. When war is forever over, when the "new social order" is established, then, and then only will the need for self-sufficiency as a means of national safety be eliminated. Until that time there must be a continued, forceful effort made for the protection of our domestic zinc industry, a vital factor in the complete list of resources necessary for the safety of our country.

The Position of LEAD

By F. E. WORMSER
Secretary-Treasurer
Lead Industries Association

ALL of the common metals are now under some form of Government control. In copper the O. P. M. has established complete priorities; in zinc the accumulation of a pool of domestic zinc for Government allocation is mandatory. Lead was placed under Government control by Order M-38 on October 4, 1941. By the terms of this Order lead producers were required to furnish statistics relating to their sales and to reserve about 15 percent of their production in a pool to be allocated by the Lead Branch of the O. P. M. Lead production was increased by domestic mines after the United States entered the war. The demand for lead continues to grow.

Lead is the last of the domestically produced non-ferrous metals to come under an O. P. M. order because it is not in the same defense classification with its sister metals, copper and zinc, so important in cartridge brass, and because, so far, lead has been available to meet a constantly growing defense and civilian demand. Incidentally, it is not easy to determine where defense uses begin and civilian uses end for many lead manufacturers. At any rate, more than enough lead is available for all defense needs no matter how broad the definition.

Demand for Shrapnel Is Less in This War

Relatively speaking, the position of lead today in rearmament is far different from what it was during the last war. Then lead was in great demand for shrapnel. Today this use is minor. It is the every day, indispensable uses for lead such as storage batteries, cable, paint, solder, plumbing goods, bearing metals and tetraethyl lead that have modern defense implications.

Even though lead is not in the same class with copper and zinc, so far as direct requirements for defense are

concerned, it, too, has experienced an extraordinarily strong demand. Although I believe that we are near the peak, the domestic consumption in the fall being about 80,000 tons per month, I should not be surprised to see even this unusually large figure increased as rearmament proceeds. Forecasters nowadays have been much chastened by today's swiftly flowing events which so often make forecasts inaccurate in the short space of weeks and I hesitate to make any prediction. One thing is sure, an even larger amount of lead could be utilized today with ease.

Consumption Is High

The largest consumption of lead occurred in 1926 when 718,000 tons was consumed, of which 95 percent was mined in this country. Today with a rate of consumption about 1,000,000 tons per year only about 45 percent is being furnished by United States mines. Lead resources outside the United States supply the balance.

Perhaps it will be easiest, first of all, in discussing the lead position, to analyze the origin of the present demand and then to examine what is being done to provide an adequate supply. Fundamentally, two kinds of uses of lead today are creating a tight situation:

(a) Increased uses of lead which might be termed normal, that is, in storage batteries, cable, white lead, red lead, bearing metals, solder, lead pipe and sheet, and tetraethyl lead, which provides the lead industry year in and year out with its bread and butter, and

(b) Uses where lead is being employed as an alternate for other metals now scarce, particularly aluminum, copper, zinc and steel. For example, the shortage of aluminum has stimulated the use of lead for foil enormously, for collapsible tubes and, to a lesser degree, for paint. Cigarettes are again being wrapped almost exclusively in composition lead-tin foil, a use that was partly lost during and after the last war. If lead were freely available about 6,000 tons per month could readily be used in foil compared with a normal demand for 2,000 tons. Then again, the shortage of copper has been reflected, in part, in a larger demand for lead plumbing goods and sheet lead. Another illustration is the increasing demand for white lead in paint to make up for the current stringency in zinc oxide, lithopone and titanium which are competitive pigments. Not only is the use of pure white lead paint increasing but white lead is carrying the burden of other pigments.

There is a heavy demand for lead-coated products in sheet and wire form to take the place of tin and zinc coatings. Telephone pole-line hardware is being lead-coated these days. Can companies are now using a coating consisting of 80 percent lead and 20 percent tin to replace the 100 percent tin standard on industrial cans. The automobile industry has been using some die-cast parts of lead because it is unable to procure sufficient zinc. Shaving cream is being packed in lead-tin tubes instead of aluminum.

Other examples might be cited. Some of them mark definite economies and may be retained when the emergency is over to the ultimate benefit of the lead industry. For example, the use of the terne mixture for coating industrial cans, being more economical than the 100 percent pure tin coating, there is no reason why this application should not be permanent. But many uses of lead today as an alternate are with us only for the duration and they pose a question as to how far the backbone uses of lead in paint, tetraethyl, cable and so on should be sacrificed to make room for the new comers. It is not an easy question to answer.

Lead Finds Increasing Use in Explosives Primers

Of particular interest to the mining industry is a comparatively new use of lead also expected to be retained indefinitely. I refer to the manufacture in the United States, in a new plant, of lead azide, an ammonia compound, which makes an excellent primer, to replace mercury fulminate in ordnance. Lead azide has never been made in the United States before. It is not quite so sensitive as mercury fulminate and is therefore safer to use. It should also be lower in cost, hence I look to see the manufacture of blasting caps so commonly used in the mining and contracting industry ultimately made of lead azide as the detonating ingredient. Of course, this use will not require large amounts of lead in peace time.

Cable manufacturers have been busier of late than for years. A new buried telephone cable line across the western country, at present under construction, will be lead sheathed. At the same time the large increase in telephone business will necessitate even more toll lines. Increased power requirements will necessitate more lead-covered cables. Increased building, defense or civilian, will need more white lead and lead plumbing goods, particularly with a shortage of other materials.

Increased aeroplane, naval and automotive defense programs will require more lead storage batteries and, even though the production of new automobiles has been curtailed, the huge and more important replacement market is still to be served.

So far we haven't considered the direct military uses of lead in the fabrication of ammunition, and there, too, one may anticipate an even larger demand for the metal to supply newly erected loading plants in the United States. Despite the fact that lead has largely disappeared as the sole metallic ingredient in bullets it continues to be needed.

Chemical plants erected for the manufacture of the many chemicals entering into the defense program require large tonnages of lead to resist chemical corrosion. And so it goes. Indeed, one could go through a whole list of lead uses and find an increase directly or indirectly ascribable to rearmament. Suffice it to say that, owing to the demand for lead from dozens of different outlets a point has been reached where over 80,000 tons are required monthly.

Canada and Mexico Sources of Large Imports

Now what has been done and is being done to meet this extraordinary demand? As I said before, nothing comparable has ever been seen in the lead industry. Ordinarily domestic lead production is enough to fill all domestic requirements. Domestic mine production, although larger than that of any other country (about 23 percent of world output) can not hope to meet alone so vast a call for lead. Foreign sources are needed to assist. Fortunately the United States lies between two other great lead producing nations, Mexico and Canada, countries from which lead may be obtained either by marine transportation or by rail. In addition, other rich sources of lead, mainly Australia, Peru and the Argentine are important, but they are separated from us by great distances and shipping facilities may be unavailable to carry all the lead they would like to release.

In turn, Mexico and other foreign lead producing countries are fortunate that they have the American mar-

ket available to them in which to sell most of their output, because their normal European outlet has been cut off by the war and they would otherwise probably have to shut down. By shipping lead to us, the British Dominions strengthen their foreign exchange position and, from that standpoint alone, find it desirable to ship all metal possible to this country.

Until July of 1941 importations of lead were made through the usual private channels. Thereafter arrangements were made by the Metals Reserve Company—an arm of the Reconstruction Finance Corporation—to import lead from several countries, particularly Canada, Mexico, Peru and Australia by direct purchase from foreign producers. In July the Metals Reserve Company made arrangements to purchase, for the balance of 1941, the current production of Mexico, (about 15,000 tons monthly), the surplus production of Canada (beyond that shipped to Great Britain and used in the Dominion) of about 8,000 tons monthly, and some Australian lead of indefinite amount. In addition, the Metals Reserve Company procured available stocks of lead from Mexico, Canada and South America. All the lead purchased through the facilities of the M. R. C. is being allocated monthly by the Office of Production Management. In July 25,000 tons were so allocated, in August 28,000 and for September 30,000.

Allocations of foreign lead purchased by the Government are made by the O. P. M. on application by consumers and are entirely a governmental responsibility. In effect then, the Government is allocating nearly all the imported pig lead, which is equivalent to about 37½ percent of the domestic consumption. It is instructive to compare this situation with that in zinc where, through a zinc priority order, 27 percent of the domestic production was pooled for distribution by the O. P. M. in September. Thus there are several means of endeavoring to make certain that all metal possible is given to domestic users and distributed equitably with war requirements uppermost.

Metals Reserve Company Buys Foreign Lead

Being a Governmental agency, the Metals Reserve Company can readily hurdle the tariff and sell foreign lead to domestic consumers at the informal ceiling price. In passing, it is interesting to reflect that, were it not for the fact that the lead industry has become well established for many years under the protection of a moderate tariff, its facilities would be far below what they are today, and the industry would have been unprepared to meet, as well as it has, the current huge demand for lead. In brief, then, the lead position as of 1941 was about in balance, somewhat like this:

Domestic demand per month	80,000 tons
Which is being supplied by:	
Domestic production (Including foreign ore lead and scrap)	55,000 tons
Mexican lead	12,000 tons
Canadian lead	8,000 tons
Australian lead	4,000 tons
Peruvian lead	1,000 tons
	80,000 tons

An increased demand can be met from Metals Reserve Company stocks of lead, with a prospect of procuring additional supplies from Peru. It is believed also that Australian importations could be increased. In addition, we must not overlook the possibility of procuring more lead from stimulated domestic production.

Domestic Supply Has Not Fluctuated

The backbone of the supply of lead being used in the United States is domestic mine production together with the lead produced from domestic scrap. Over the past two years there has not been much fluctuation in the domestic mine supply which has averaged a bit under 40,000 tons per month. It would be very helpful in the present lead situation to see this output increased.

Until the summer of 1941 it seemed safe to expect that foreign supplies of lead would be adequate to help fill the domestic demand, but of late it appears from the constantly upward revision of defense requirements and possible interruption of a marine borne foreign supply of lead, that domestic producers will have to work out some program with the Government to produce more lead from the United States. One thing is sure, the maximum possible lead tonnage which conditions at the mines nowadays permit is needed.

It is instructive to note that the period during which lead production in the United States was at its peak —1925 to 1929 inclusive—brought out about 50,000 to 60,000 tons per month at an average price of 7.50c per lb. New York. I realize that a comparison between the late twenties and the early forties is not exactly a proper one because of the different operating conditions during each period, but the principal producers then are the principal producers today. Only they didn't have to cope with the 40-hour week, overtime penalties, collar to collar working conditions, or union aversion toward a longer work week.

Increased Output Requires Time for Development

I am afraid some people have the impression that lead mine supplies can be turned on and off like water through a spigot. They can not understand why lead supplies do not increase to meet the high demand today. They do not realize the necessity and costly nature of the exploration and development work required to find and open up new faces of ore, nor the time needed to do so, nor the fact that they can only be mined once, nor the difficulty in procuring a supply of skilled miners and common labor, nor the need occasionally for more hoisting machinery or milling equipment, nor the effect of labor and tax laws upon mining. Indeed, the major lead

Stope in zinc-lead mine of St. Joseph Lead Co. Balmat mine, St. Lawrence County, N. Y.

producers have a trying problem to answer how far they are justified—if at all—in the light of present conditions, and their possible continuation, in making heavy capital expenditures that may not be needed when the emergency is over. And as for the marginal producer, we rarely hear of any new or closed property coming into production.

The primary reason, of course, for the steadiness of the mine supply is the fact that the lead market has not risen much in the last year. The normal economic mechanism — price — through which increased supplies of lead come on the market has not been operative but has been under Government control. Last spring the price stabilization division of the Advisory Commission to the Council on National Defense suggested a ceiling price on lead at 5.85c per lb. New York, a ceiling which has been scrupulously observed by the primary sellers. Apparently the present price of 5.85c is not bringing to light all lead that the country needs. A greater inducement must be given to the American miner if more lead is to appear from domestic resources.

Higher Price Would Stimulate Production

As the Government has assumed the heavy responsibility of controlling the price of lead, it will, if it deems best, have to determine what price will bring out an additional supply, and how much, and what kind, of a price inducement shall be used; that is, a bonus for additional production, or a general increase in the price. It is worth noting that while the price of lead has a ceiling there has been no ceiling in wages or the cost of many supplies used in the operations of the lead mining and smelting companies. Hence, it is quite conceivable that as domestic operating conditions become more difficult and costly even less lead may be produced if today's price level remains.

Theoretically, from a long range point of view, it might be most advantageous to keep lead at a moderate price level and to import all the lead needed to satisfy the present huge domestic demand which the domestic mines are unable to fill. Unfortunately this theory runs the risk of failure unless marine and other transportation facilities bring in all the Australian, South American and other lead supplies in the quantities needed.

These days it is easy to forget that after the defense program is over the normal, everyday uses for lead will determine whether or not the lead mining and smelting industry remains active. That period will be complicated by the fact that some metals, particularly aluminum, zinc and steel, will be available in larger quantities than ever before, ready to replace lead wherever substitution can be most economically done. It would therefore seem the better part of wisdom to anticipate this situation, and to plan now the necessary program to make certain that no one forgets how useful and indispensable a metal is lead.

Review of the IRON ORE Industry

• *Iron Ore Production Rises to New All-Time High*

By PATRICK BUTLER
Vice President
Butler Brothers

STEEL has long been regarded as the bone and sinew of our American life. In times of emergency it has been our bulwark. It is furnishing the tools of defense not only for ourselves, but to the other nations that are fighting the powers of aggression and enslavement. The steel industry of this country is confident that it can meet the extraordinary demands placed upon it, and that confidence rests in no little degree upon the ability of the iron ore industry to supply the basic raw material of steel.

During 1941, the iron mines of the United States shipped approximately 94 million gross tons of iron ore, of which 80.6 million tons, or nearly 86 percent came from the Lake Superior District. To appreciate these rather staggering figures, comparisons with the output of former years is necessary. This 80,600,000 tons of Lake Superior iron ore is nearly 14 million tons greater than the shipment of the former peak year, 1916, when the movement of 66,673,000 tons was recorded; it is 140 percent greater than the average annual shipment of the preceding 10 years, 1931-1940; 70 percent greater than the average of the 5 years prior to 1941, and 26 percent greater than that of 1940.

Consumption Has Been at Record Rate

Consumption of domestic iron ore in 1941 is estimated at more than 87 million gross tons. The excess of shipments over consumption, mostly Lake Superior ore, is not large when we consider the increasing scarcity of scrap and the resultant greater proportion of pig iron, and hence iron ore, needed to produce a ton of steel. Also, mine shipment figures must be reduced by approximately 1 percent to allow for shrinkage, hence, the actual tonnage of ore available at furnaces was about 93 million tons. Taking out about 1½ million tons from United States mines supplied to Canadian furnaces, there was an excess of about 4½ million tons of United States shipments

above United States requirements, on the calendar year basis.

From the ore consumed, together with some 27 million tons of purchased scrap, there was produced in 1941 nearly 56 million net tons of pig iron and nearly 83 million net tons of steel.

Great as has been the production of iron ore this year, still greater demands are to be made. During 1941, pig iron capacity in the United States has been increased about 2 million net tons by enlargement of existing blast furnaces and by construction of three new furnaces, and nearly 3½ million tons of additional capacity is under way and proposed to be completed in 1942. Plans announced some time ago by defense officials in Washington indicate still further additions—in part already started—which are proposed to increase the total pig iron capacity by the end of 1943 to some 10.8 million net tons above what it was at the beginning of 1941.

Increased Pig Iron Capacity Will Call for Even More Production

While these increases in blast furnace capacity affect nearly every iron and steel producing district—lower lakes, eastern, southern and western, and even includes a new furnace and steel plant in Texas, most of it is in connection with plants which consume Lake Superior ore. Obviously, the additional ore required must be supplied largely from the great open pit mines of the Mesaba Range in Minnesota.

Due to the fact that furnace capacity, dependent on Lake Superior ore, to be blown in about the end of 1942 or early in 1943, and not appearing in 1942 production, must be supplied for several months with ore from stocks resulting from 1942 shipments, actual Lake Superior ore requirements from the 1942 movement will be greater than in 1941. With comparatively little increase in equipment, the mines can produce the needed amount. The Upper Lake railroads, too, with no great additions to their equipment can handle the increased tonnage, given good boat service.

However, the Great Lakes shipping industry has worked practically at capacity this year to move the record 80,116,000 tons shipped by water, and it was favored with exceptional weather. More vessels will have to be built. The Great Lakes shipping industry, in conjunction with Great Lakes shipbuilders, the Maritime Commission, and defense officials, is currently resolving the problem of lake transportation by arranging to build additional capacity, which, it is hoped, will meet requirements through 1943.

New Ore Carriers to Be Built

Five large ore carriers are now under construction by private interests and are expected to be put into service about midsummer this year, and to carry a million tons or more during the season. Construction of an additional 16 vessels is provided for by the Maritime Commission, and these are expected to be put into service during 1943. All together, these 21 vessels will add approximately eight and one-half million tons to the lake fleet capacity in a favorable season comparable to 1941. Additional vessels will be required to meet the needs for ore in 1944 indicated by the increased blast-furnace capacity expected to be available by then.

Our Lake Superior industry, like all others, has been experiencing difficulties and delays in obtaining machinery and equipment, repair and maintenance material. But we are hopeful that the situation in Washington will clarify and that we shall not be prevented from delivering the required tonnages.

The expansion in this district has been mainly one of enlarging present operating mines and stripping new open-pit properties, and this work is continuing vigorously. On the Marquette Range one company is now engaged in sinking a shaft to a depth of 3,000 ft.; this will serve a large new mine.

Reserves Being Depleted Rapidly

This great expansion in ore production means the very rapid depletion of high-grade ore reserves in the Lake Superior region and will accelerate the time when the country will be de-

Ore sorting yard, Lake Superior district

pendent on higher cost beneficiated ores. The companies engaged in the iron-ore industry have been fortifying themselves against this contingency and in recent years more and more attention has been paid to various methods of extracting the values from the leaner formations. The steel companies, through their operating subsidiaries, have been acquiring vast tonnages of low-grade reserves.

Of interest this year in this industry is the further acquisition of properties by consuming interests in the Adirondack and Clifton districts of New York. There are now three large steel companies mining or preparing to mine in that state. Further interest, too, has also been shown in the New Jersey magnetite deposits, with the reopening of several old mines there. The increased activity in the entire northeastern ore district is indicated by the U. S. Bureau of Mines figures showing 3,963,000 gross tons of magnetite ores shipped from mines of this region in 1941, which is an increase of 9 percent over the 3,637,000 tons shipped in 1940. Most of this ore was concentrated before moving to furnaces.

Increases in Production from All Districts

Additional properties are being opened in the Birmingham district as well as in northern Alabama, at Russellville and Leighton. Total 1941 shipments from the Southeastern States are reported by the Bureau of Mines at 7,977,000 gross tons, an increase of 7 percent over 1940 shipments.

In the Western States also iron-ore output was expanded in 1941. Shipments are reported at 1,429,000 gross tons, an increase of 17 percent over the 1940 movement.

Imports of iron ore in 1941, according to the Census Bureau reports available through September, are estimated at approximately two and one-fourth million tons, or about 10 percent less than in 1940. About three-fourths of this tonnage was from Chile, and the balance from Cuba, Brazil, Canada, and Newfoundland. Declining imports, which relatively may be even more pronounced as the war advances, together with increased capacity erected at eastern iron and steel plants, means proportionately greater dependence of those plants upon lake ores.

It is clear that our vast iron-ore deposits, together with efficient and closely integrated transportation facilities, and great iron and steel plants, are the very essence of our national defense and of our war effort.

The Position of the QUICKSILVER Industry

By GORDON I. GOULD
H. W. Gould & Co.

THE mercury—or quicksilver—industry has, during the past two years, received more than its usual share of attention, due principally to world conditions which have tended to disturb all industries. Disturbance in this relatively small industry has been proportionately larger than in many others for several reasons, which will be briefly described and will explain, in part at least, the attention paid to the quicksilver industry.

First, Spain and Italy normally produce approximately 80 percent of the world's supply of quicksilver, and both these countries are currently Axis dominated and controlled.

Second, the British Empire, until shortly after it entered the war, had no substantial source of quicksilver within the empire, and their present source will not provide adequately for British needs.

Third, the United States, which normally rates as the third largest producing country and under normal conditions produces 10 to 15 percent of the world's supply, up to two years ago depended largely on imports to provide an adequate supply for domestic needs.

Fourth, Mexico, normally the fourth producing nation, becomes an important factor in balancing production and consumption in the United States or in other countries outside of the Axis; and

Fifth, increased demand for the metal during the war period has made the situation in all the nonself-sufficient countries even more acute.

Domestic Production Has Risen Rapidly

The principal attention paid the American quicksilver industry has

Mines of Bottle Creek district, Humboldt County, Nevada

been with respect to rate of production and the increase in price. In the years 1934 to 1939, inclusive, production in the United States varied over a narrow range between 15,445 and 18,633 flasks annually, averaging 17,111 flasks per year. Imports during this same period varied over the wide range of 2,362 to 18,917 flasks annually, with the last two years of the period showing the smallest amounts imported. The average annual import for the period, however, was 10,146 flasks which, together with the production, indicates an available annual supply of 27,257 flasks, exclusive of exports. Exports of quicksilver were less than 1,000 flasks annually, however, so that the annual consumption approximated 26,500 flasks.

By the end of 1939 conditions were considerably changed from the above averages over the preceding six-year period. Spanish and Italian quicksilver was no longer available and domestic requirements were increasing. The American production had to increase, and it did. The production for 1940 was 37,777 flasks—more than in any year back to 1883, which was the last year of America's greatest productive period—from 1875 to 1883. The 1940 rate of production was maintained in the early months of 1941 and toward the year's end exceeded it by nearly one-third. When final figures are released it is estimated that the production for the year will approximate 44,000 flasks. This increase in production has attracted attention of two kinds. The first in that it has been made in a very short time by a small industry from relatively small producing units; and, secondly, in that it raises the question as to why normal production cannot be maintained at a higher rate than represented by the average figures just cited.

Price Increase is Principal Factor in Large Production

Explanation of both these can be made in looking at the price increase during the same period. During the six-year period in which production was averaged the average price for quicksilver was $82.56 per flask, New York. This meant that a producer in the western part of the United States received about $76, or $1 per pound of metal produced. During that period an average of 95 mines each year contributed toward the total production; many of these producers were very small, contributing less than

Bonanza mine, Oregon. Second largest quicksilver producer in the United States

50 flasks per year. Likewise, a large percentage of them were financially unsuccessful. In other words, at this price there was very little stimulation or incentive to produce larger amounts or discover new properties.

In September of 1939, however, the price rose from $84.41 to $140 per flask and remained at approximately this level for the balance of the year. It was foreseen by the industry that imports would be restricted, if not completely curtailed, and with an increase in price the incentive for more production was born. The production increased with an increasing price until June, 1940, in which month the average price was $197.36 per flask. This price marked the high for the year and it dropped to $164.96 in December, but made an average price for the year of 1940 of $176.87 per flask. During the year of 1941 the price has steadily risen from about $165 in January to nearly $200 in December, making an average price for the year of $185 per flask—the highest yearly average price in history. Although there are a few mines producing at the present time which could continue to produce at a somewhat lower price and still maintain their current rate of production, it is quite obvious that, in order to maintain the present total rate of production, prices very near to the present level must be maintained.

Domestic Production Must Continue to Supply Market

In looking into the future of the quicksilver industry, it is difficult to determine what the turn of world events will establish. It is quite certain that so long as present war conditions exist, requiring a substantial amount of this strategic metal, prices

Wild Horse mine, Churchill County, Nevada

must be maintained at such a level as to stimulate all-out production. The Bureau of Mines has, during the past two years or more, examined several areas to determine potential ore reserves. Low-grade areas have been checked and determined but they can only produce at high cost. Costs of present operations have increased with inflation and other factors running hand in hand with wartime production. It is noteworthy that the larger proportion of present production is still derived from old mines—mines reopened after several years—or old mines in which old known areas are being reworked—all at higher cost. Very few new mines have been developed during the past two years. Those that have been developed, with not more than a few exceptions, have been small, high-grade deposits, quickly worked out and abandoned. The average grade of the most substantial producers probably does not exceed 6 lb. per ton and might be somewhat below this figure.

It is also interesting to note that a substantial percentage of the production of the larger producers has been contracted for in future sales—much of it at prices considerably below so-called "average prices," making the average price quotations slightly on the high side. These contracts—with the larger chemical firms and with the Government for stockpile purposes—offer a guarantee to the quicksilver producer which is unheard of in ordinary times.

Quicksilver producers have recently been faced with cautionary warnings from Washington and rumors of a price ceiling. Certainly any appreciable reduction from present free workings of supply and demand will tend to reduce domestic production. Although it is reported that as much as 2,000 flasks monthly may be imported from Mexico for defense needs and to stabilize the domestic market, it is not believed that any such quantity has yet been imported; and in order to import this quantity it is more than likely that Mexican prices will not vary greatly from domestic prices.

An important incentive to the investor, willing to put capital into worthy quicksilver property development or equipment, was lost this last year in the removal of the exemption from excess profits tax applicable to producers not only of quicksilver but also of other strategic metals.

Increased labor costs, difficulty in obtaining materials and supplies, and the increase in clerical help necessary in fulfilling requests for reports, priorities and other information will naturally dampen the enthusiasm and incentive for locating and putting into production new properties. Older operations must curtail development and the rehabilitation that quicksilver mines enjoy only during years of favorable prices.

In general, however, it appears that the United States will be able to maintain a production rate approximately equal to that of 1940 and 1941 for another year or two, assuming that something near present prices can be maintained and that costs do not advance materially. New ventures have and will continue to come in with varying degrees of success but their production will contribute substantially to the total. Although it is not likely that new, large producers will be developed, it is quite reasonable to expect that the United States will be able to maintain her self-sufficiency in this metal for quite a number of years from still lower-grade, higher-cost deposits.

Leagrant mine, San Benito County, Calif. A new mine

Sulphur Bank mine, Lake County, Calif.

Bretz mine, Malheur County, Oregon. Steam shovel mining of low grade opalite ore

Manganese Deposit Examined

What is reported to be one of the largest single deposits of manganese ever discovered in California, on the James Maxwell ranch in the Salt Spring Valley, Calif., was recently examined by mining engineers. The deposit is reported to contain over 200,000 tons of commercial manganese ore, and further exploration is expected to prove additional quantities. Tests have shown that the ore carries 59 to 60 percent manganese. It was stated that a test on 500 tons of the ore might be made by one of the large central California cement companies interested in working out a recovery method.

MOLYBDENUM—Supply Increased

IT is important to consider the status of various minerals essential to our war efforts, and to so direct activities that there will not be a shortage of these materials. Molybdenum is one of these which should be considered at this time for its largest application is as an alloying element in cast iron and steel, and as such has assumed an important place in the transformation which is taking place in industry.

Molybdenum differs from the precious metals in that it has never excited the desire of man to dig it out of the ground in order to bury it in a vault or hole, as is true of gold and similar metals. Molybdenum also differs from such metals as copper, etc., which may be found existing free in nature and which, as a result, have been used for thousands of years, thereby creating through use a demand of long standing. Molybdenum, in fact, lacks some of the attributes that would make its early use probable. It is therefore not surprising that, although there are indications of its early use (1300 A. D.), there was only a limited normal demand for molybdenum when relatively large deposits were uncovered. The oversupply resulting from these discoveries, and lack of demand, became a serious problem. In order to learn more about this element, and thereby discover more of its uses, a program of metallurgical research was instituted by those interested in its development. Gradually at first, as industry using this information experimented with its application and then more rapidly as it learned of its possible uses at home and abroad through experimentation, the demand for molybdenum increased during the past 10 years. As this development progressed, metallurgical investigation continued to lay the ground work for its use in the future, and as a result molybdenum is being successfully used in construction steels (low alloy—high strength type), engineering steels, high speed and die steels, steels designed for service at elevated temperatures, corrosion resistant steels and abrasion resistant steels. Molybdenum has also found a place of similar importance as an alloying element in gray and white cast iron, as well as malleable cast iron. Pure molybdenum is used for radio filaments, electrical applications, etc. Outside the metallurgical field, but of growing importance, is the application of molybdenum as a catalyst in the chemical and petroleum industries, as a coloring agent in the paint and glass industry, etc. The adoption of molybdenum by industry in general is of all the more interest because it has taken place in such a relatively short time.

By JOHN E. WILSON
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Use of Molybdenum Has Increased Rapidly

The increased use of molybdenum during normal times has been reflected in an increased demand as shown in Table I. Of recent years world events, first abroad and then in this country, have superimposed another demand upon that created by normal business. Modern war demands machines to make modern weapons of metal and, as a result, it is inevitable that those elements which have been used successfully to improve cast iron and steel during normal times will be pressed into service.

Reviewing events during the past few years, the increased foreign industrial activity incidental to the preparation for war will be noticed. Normally this activity would result in an increasing foreign demand for alloying elements, and by the end of 1939 the amount of molybdenum concentrates shipped abroad amounted to 43,554,310 pounds.

On December 15, 1939, the producers of molybdenum were asked by the Government to observe a moral embargo of molybdenum. Due to the fact that the United States produced 92 percent of the world's supply during 1939, and that a major portion was exported, this Government request had a pronounced effect upon the demand for molybdenum. It is noteworthy that there was no hesitancy on the part of the producers to cooperate with the Government to the fullest extent. Efforts were continued to find new uses for it in this country, and, although new developments appear regularly, their general adoption takes time and could hardly offset the reduction in the export business resulting from this embargo. (Exports during 1940 were 70 percent less than the year previous, shipments moving only to England and her allies.)

In the latter part of 1940 an increased demand for molybdenum in this country became evident as more steel was being furnished to the allied powers and our own defense plans started to materialize. As the Lend-Lease Bill became law, and our defense plans progressed still further, the demand for molybdenum increased. As it became increasingly difficult to maintain the stock piles of other alloying elements which are normally imported in large quantities, these elements were placed on a priority list. This move was made so that the most important projects in the defense program would be sure to receive the material they required. However, the shortage has necessitated the development of total or partial molybdenum bearing substitutes (such as molybdenum and molybdenum-tungsten high speed tool steel).

Molybdenum Has Been Substituted for Scarcer Metals

The demand for molybdenum bearing substitutes, together with increases in normal and war production demands for molybdenum, has rapidly made up the amount of business lost by closing off the major portion of the foreign market in 1939. Molybdenum continues to be used in increasing quantities in those peace-time applications which were developed earlier and which may be used indirectly in the war program, such as commercial trucks and locomotives, used in transporting war materials,

etc. Those applications which were developed during peace times, but are directly adaptable to the war program, such as airplanes and trucks, which have been fitted by slight changes in design for army service, etc., have increased the demand for molybdenum noticeably. During normal times the manufacture of ordnance is held to a minimum, and as a result the use of molybdenum in this application was relatively small. Now, due to the change in events, the use of molybdenum for applications of this nature has increased rapidly.

Since the steel producers are operating at very near their capacity it might be suspected that there would be very little further increase in the demand for molybdenum. However, it should be remembered that the industrial transformation from peacetime production to war-time production has not been completed, and it is quite probable that in many instances when this change is made an increased demand for molybdenum will be noticed. The immediate future demand for molybdenum is also partly dependent on our ability to keep open the supply lines of those alloying elements which are in large part imported. This in turn depends upon our transportation facilities, diplomatic successes, and the fortunes of war in the South Atlantic and the Pacific.

TABLE I—MOLYBDENUM DOMESTIC PRODUCTION SOLD 1921-1941

	Pounds
1921§	....
1922	....
1923	22,667*
1924	297,174*
1925	1,154,050
1926	1,431,830
1927	2,286,075
1928	3,329,214
1929	3,904,648
1930	3,759,269
1931	3,157,000
1932	2,373,000†
1933	5,761,000
1934	9,377,000
1935	10,892,000
1936	17,959,000
1937	30,122,000
1938	25,727,000
1939	32,415,000
1940	25,329,000
1941	38,000,000‡

§ There were small quantities of molybdenum produced in U. S. prior to 1921.

* Estimated by Bureau of Mines.

† Includes some molybdenum stocked at mines.

‡ Estimated

1921-1930 statistics — Mineral Resources of U. S. U. S. Dept. of Commerce, Bureau of Mines, 1925-1930.

1931-1940 statistics—Mineral Year Book, U. S. Bureau of Mines. Review of 1932, 1935, 1937, 1939 and 1940.

Supply Is Sufficient for Current Demand

There have been no new large deposits of molybdenum developed recently, although there has been considerable search for them. However, the major producer of molybdenum has increased its operations, and it is believed that, because of this fact, coupled with the reduced foreign shipments resulting from the normal embargo, the current demand will be met. Since it is difficult to predict what the near future will require, it is impossible to state positively that the present sources can adequately take care of uncertain increases in demand.

After World War II is over and molybdenum has done "its part" it is felt that the industry will again be faced with a problem of oversupply. This conclusion is reached after due recognition of the fact that governmental demands will be greater than ever before in peace time, that there will be a larger, though badly disrupted, foreign market, that by-product sources of supply will be curtailed and that some of the new uses for molybdenum developed as a result of the war will be retained. The supply of molybdenum has increased tremendously during the recent years, and it is felt that because of this and because the defense and industrial demands will be considerably deflated after the conflict, the supply will be more than adequate. Then, more than ever before, molybdenum producers will turn to research for a solution to their sales problems.

COPPER IN 1941*

The rapidly expanding defense program in 1941 resulted in an unprecedented demand for copper. Mine production was more than five times that for the depression low in 1933 and was only slightly below the record established in 1916. Refinery production achieved a new record and, as there was a large surplus of imports over exports, copper available for domestic consumption increased markedly over previous peaks.

By T. H. MILLER
Metal Economics Division
Bureau of Mines

MINE production of recoverable copper in 1941 was estimated at 957,394 short tons, an increase of 9 percent from 878,086 tons in 1940. The 1941 output, although not a new record, was one of the highest ever attained and has been exceeded in only two other years—1916 with a production of 1,002,938 tons and 1929 with 997,555 tons. The 1941 production is particularly impressive when it is remembered that as recently as the period 1932-35 the average annual output was less than 262,000 tons. It was larger than the average (885,826 tons a year) for the 1925-29 period and even exceeded the average (912,425 tons a year) for the first World War period of 1915-18. The average price in 1941 was 11.7 cents a pound (electrolytic, Valley), a modest increase from 11.3 cents in 1940. The average yearly prices during the war period ranged from 17.47 cents in 1915 to 29.19 cents in 1917, while the 1925-29

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prices ranged from 13.05 cents (1927) to 18.23 cents (1929). There has always been a close relationship between copper price and copper production, but since 1938 production has increased much more rapidly than has price. Production in 1941 was 72 percent higher than that (557,763 tons) in 1938 but average price was up only 16 percent (10.1 cents in 1938).

The table that follows gives mine production by states for 1939, 1940, and 1941 and a percentage increase or decrease comparison of 1941 with 1940. It will be noted that most of the gains were made in Arizona (up 51,581 tons) and Utah (up 30,713 tons). These two states produced 62 percent of the total copper in 1941. Modest increases were recorded in the other large producing states (Michigan, Montana, Nevada, and New Mexico), but minor decreases were indicated in most other states. Following is a brief review of the outstanding events in copper mining in 1941, by states:

Arizona.—Arizona retained its position as the largest copper-producing state, contributing 35 percent of the total United States mine output. The production of 332,750 tons in 1941 was almost exactly the same as the average annual output (332,354 tons) for 1915-18, but it was about 12 percent below the yearly average (378,175 tons) for 1925-29. The state record of 415,314 tons was established in 1929. The New Cornelia mine (Phelps Dodge Corporation) was again the largest copper producer in Arizona, followed by the Inspiration, Copper Queen, Nevada Consolidated (Ray), United Verde, Miami, Magma, Morenci, and Denn properties. Output from these nine mines (which supplied 99 percent of the state total) increased about 51,000 tons in 1941. Notable increases were reported in the Globe, Ajo, and Mineral Creek (Ray) districts, and modest increases were indicated in the Verde, Morenci, and Pioneer districts; copper from the Warren (Bisbee) district decreased slightly. Only a slight gain was made in the Morenci district in 1941, as the new 25,000-ton concentrator was not completed in time to influence 1941 production, but the mill and the new 1,200-ton smelter are expected to operate at capacity in 1942 with an anticipated production of 70,000 to 80,000 tons of copper. Increases at other properties are also indicated for 1942, and copper production in Arizona in 1942 may again exceed 400,000 tons.

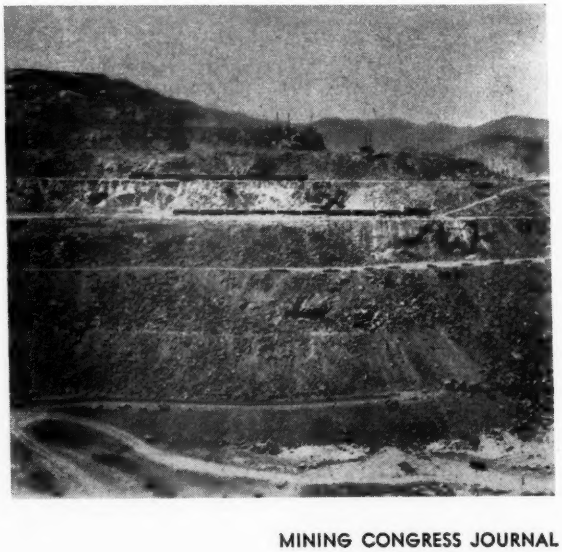
Utah.—Copper from Utah increased to 262,577 tons in 1941, by far the largest production in the history of the state, as the Utah Copper Co., the largest copper producer in the United States, operated its open-cut mine at Bingham and mills at Arthur and Magma at above rated capacity all year. The mine was operated on a seven-day basis, and the two mills (originally rated at about 30,000 tons a day each but recently enlarged to about 40,000 tons) handled an average of 88,000 tons a day for the entire year. As a result, copper from the Bingham district increased from 228,505 tons in 1940 to about 260,422 tons in 1941. As this property is currently operating at above rated capacity, no substantial increase can be accomplished, except by additions to present physical plants, and such a program of expansion is not likely to affect 1942 production. Copper from Utah in 1942 is therefore likely to remain about the same as in 1941.

Montana.—Montana again ranked third in copper production, but the output increased only 1 percent in 1941 as compared with 1940 and was 12 percent less than that in 1937. During the war period 1914-18 Montana averaged about 145,000 tons of copper a year, and during the period 1925-29 the average was 129,376 tons, only slightly higher than the 1941 rate. The Anaconda Copper Mining Co. operated the copper properties at Butte continuously in 1941, but the output of copper declined slightly during the second half of the year. The smelter at Anaconda has ample capacity to handle increased production at Butte, and with a full 7-day-week operation at the mines it is possible that Montana could again attain the 145,000 ton annual rate.

Nevada.—Production of copper in Nevada increased only slightly in 1941, but the output (78,810 tons) was much higher than either the average for 1925-29 of 60,040 tons or the annual average for the war period of 46,089 tons. Copper from the Nevada Consolidated Copper Corporation property at Ely increased in 1941, and that from the nearby Consolidated Coppermines Corporation was about the same as in 1940, but copper from the Mountain City Copper Co. property in Elko County decreased. Only modest increases in copper production are indicated in 1942.

New Mexico.—Copper from New Mexico increased to 71,562 tons in 1941, an increase of 2 percent and a new record for the state. In the world war period average copper production in New Mexico was about 41,000 tons, and during the period 1925-29 the average annual output was 41,989 tons. The Nevada Consolidated Copper Corporation operated continuously in 1941 at the open-pit Chino mine at Santa Rita and the concentrator and new smelter at Hurley. The mill has a normal daily capacity of 17,500 tons and was operated at above capacity part of the year; the new smelter, placed in operation in May 1939, established a new record in blister production. No substantial increase in copper production is forecast for 1942.

Michigan.—Copper from Michigan (included under Central States in table) increased from 45,198 tons in



Benches of the new Morenci mine of Phelps-Dodge Corp.

1940, to 46,535 tons in 1941. The producers were, as usual, the Calumet and Hecla Consolidated Copper Co., Copper Range Co., Isle Royale Copper Co., and Quincy Mining Co. Copper from Michigan in recent years has averaged about 45,000 tons a year, a substantial increase from the depression low of 23,427 tons in 1933, but it has been much lower than in earlier years. In the period 1925-29 Michigan averaged 87,292 tons a year, and during the war period the average was 120,031 tons a year. During 1941 the Office of Price Administration and other Government agencies made detailed studies of operating conditions and costs in Michigan, resulting in contracts with the producers that will allow payments by Government agencies of prices ranging up to 15 and 16 cents a pound for copper produced in Michigan. No forecast can be made as to probable production in 1942, but it is expected that the figure will be well above the 1941 rate.

Other States.—A moderate increase in copper production was recorded in the eastern states in 1941, as normal production was maintained in Tennessee and Pennsylvania; but decreases were recorded in California due to the closing of the Walker property, in Colorado due to reduced output of copper ore from the Eagle mine, in Washington due to the lower grade of the ore treated by Howe Sound Co., and in several other states of small production.

Smelter and Refinery Production Also Expanded

Primary smelters produced about 979,500 tons of copper from domestic ores in 1941, an increase of 8 percent over the 1940 output of 909,084 tons. The December rate was estimated at 87,000 tons or 7 percent above the average for the preceding 11 months. The 1941 smelter output has been exceeded in only one other year—1929—when 1,001,432 tons were produced.

Copper refineries in 1941 produced 961,500 tons of copper from domestic ores, 425,500 tons from foreign ores, and 90,000 tons from secondary materials, a total of 1,387,000 tons of new copper or 1,477,000 tons of new and secondary copper. Compared with 1940, these figures indicate increases of 4 percent from domestic ore and 10 percent from foreign ore but a decrease of 24 percent from secondary. Refinery production of new copper established a new record

MINE PRODUCTION OF COPPER IN THE UNITED STATES, 1939-41, BY STATES OR REGIONS, IN SHORT TONS

Region and State	1939	1940	1941	Percent of increase or decrease in 1941
Eastern states	10,648	12,745	13,453	+6
Central states	43,985	45,883	47,595	+4
Western states:				
Arizona	262,112	281,169	332,750	+18
California	4,180	6,438	3,905	—39
Colorado	13,215	12,152	6,501	—47
Idaho	2,516	3,349	3,900	+16
Montana	97,827	126,391	127,500	+1
Nevada	66,597	78,454	78,810	——
New Mexico	46,142	69,848	71,562	+2
Utah	171,890	231,864	262,577	+13
Washington	8,998	9,612	8,642	—10
Other	82	126	107	—15
	673,559	819,403	896,254	+9
Alaska	128	55	92	+67
Total United States and Alaska	728,320	878,086	957,394	+9

in 1941, the output being slightly greater than the previous peak of 1,370,056 tons established in 1929. The new record was due in part to unprecedented output from foreign ores, as production from domestic ores (991,366 tons) in 1929 was slightly greater than that in 1941. Production of refined copper from secondary materials has exceeded the 1941 figure in many recent years, and the decline in 1941 is attributed to the difficulty of obtaining low-grade copper scrap at prices in balance with the 12-cent copper price.

Imports Increase and Exports Decrease

Statistics on imports and exports have not been released by the Department of Commerce since September 1941; but total imports of copper in 1941 will obviously establish a new record, as imports for the first nine months of the year were 7 percent above the total for all of 1940, which previously was the record year. Most of the gain was in refined and unrefined copper from Chile. Exports declined markedly in 1941 to the lowest point in two-score years. As a result, the total copper available for consumption in the United States reached the highest level in history and possibly exceeded the previous peak by as much as 50 percent.

Outlook for 1942

Many projects, both approved and projected, will ultimately bring about marked increases in mine production of copper. In Arizona, for example, completion of the first part of the Morenci program will result in a substantial increase in 1942, and present plans for expanding the plant to 135,000 tons annually will again increase the output in 1943.

Other Arizona projects affecting both 1942 and 1943 include Inspiration, Bagdad, and possibly Castle Dome. In view of the time necessary to materially increase physical plant capacity at the existing major producers, most of the increases in 1942 will have to come from more complete use of existing plants; this, in turn, is limited by difficulties in placing plants on a full 168-hour week basis. Although a substantial increase is in sight in Arizona in 1942, only moderate gains are probable in other states. Under present conditions forecasts of production are extremely hazardous, but a conservative estimate would place 1942 mine production of copper at about 1,035,000 tons. Smelter production will be of the same order and a continuation of the unusually high rate of refinery production will again depend on continued imports of foreign blister copper.

New Dredge For Alaska

The Idaho-Canadian Dredging Co. plans on having its new dredge on Big Gold Creek, Alaska, operating by next fall, according to statement by the company.

The Idaho-Canadian company purchased its dredging ground from William Williams, pioneer Sixtymile operator. The property consists of seven miles of virgin dredging ground.

Part of the dredge that will be installed on Big Gold arrived in Dawson in the late fall.

The Domestic MANGANESE Situation

By FREDERICK LAIST
General Metallurgical Manager
Anaconda Copper Mining Co.

THE quantity of manganese ore or concentrate of ferro-manganese grade required annually in the United States may be estimated roundly at one and one-quarter million long tons, containing 48 percent of manganese and a maximum of 7 percent iron, 10 percent silica, 6 percent alumina and 0.18 percent phosphorus. Before the war nearly all of this ore was imported from Russia, Africa, India, Brazil and Cuba. Small amounts came from Chile and elsewhere, but for all practical purposes the steel industry was dependent upon imports from these five countries.

Manganese ores are very widely distributed and occur in the states of Washington, Oregon, California, Idaho, Montana, Utah, Nevada, Arizona, New Mexico, Colorado, Texas, Arkansas, Missouri, Wyoming, Minnesota, Michigan, Alabama, Virginia, West Virginia, Georgia, Massachusetts, South Dakota, North Carolina and Tennessee.

Domestic High Grade Deposits Almost Non-existent

Unfortunately, high grade ore deposits are virtually non-existent in the United States, and medium grade ores which are amenable to concentration occur in relatively small deposits and are sometimes contaminated with phosphorus which remains with the concentrate. For some years past the Bureau of Mines has made extensive surveys of manganese occurrences in the United States to determine their extent and the methods which might be used for their beneficiation during the present emergency. The aim is to produce concentrates by mechanical, smelting or leaching processes, which will be suitable for the manufacture of ferro-manganese in existing furnaces and thus replace imports from sources outside of the Western Hemisphere. In addition, the Bureau has developed a process for producing electrolytic manganese which is now being used in a small way at a plant in Knoxville, Tenn.

The principal manganese minerals are pyrolusite, psilomelane, wad and rhodochrosite. Occasionally rhodonite occurs, but for the most part the ores are more or less hydrated mixtures of the higher and lower oxides of manganese and carbonates. These are more or less intimately associated with iron, lime or magnesia, sometimes forming complex minerals which it is obviously impossible to separate by mechanical means. The manganese minerals may be either hard or soft, and are frequently so intimately associated with siliceous gangue that grinding to 200 mesh does not effect a separation. Each manganese ore presents a special treatment problem to a much greater extent than is true of non-ferrous ores of copper, zinc and lead. In some of the states named above there occur ores which may be concentrated by jigging, tabling or flotation and in the aggregate a considerable tonnage of manganese concentrate can probably be produced by such means. Recoveries are generally low, say, 60 percent to 70 percent from ores containing around 20 percent manganese.

Production Is Being Stepped Up

The production from the above states has been small and as yet there has been no considerable increase except in the case of Montana. The Philipsburg district has been a steady producer for many years and its output has been stepped up materially. The concentrates are largely of battery grade and command a premium, which is one of the reasons why this district produces so persistently. There has been a very considerable increase in the production from Butte and facilities for concentrating the ore and nodulizing the concentrate produced therefrom have been in operation since last summer. The ore runs about 20 percent manganese, which occurs mainly as rhodochrosite in siliceous gangue. The concentrate runs about 39 percent manganese and after elimination of CO_2 a nodulized product is obtained running about 60 percent manganese.

This is the only really substantial supply of ferro grade concentrate in the United States today, and is comparable to the Cuban production which is somewhat larger in quantity but of a lower grade. In terms of manganese metal, the two operations are about on a parity and production from these sources can probably be increased. Cuban manganese comes in free of duty, and since Cuba is separated from the United States by only a narrow stretch of water, it may almost be considered in the same category as domestic manganese. It is likely that about one-third of the manganese requirements of the country can be obtained from Cuba, Montana and from other localities in the United States from ores which can be concentrated mechanically. Some of the milling projects might have to be financed by the Government and technical assistance would have to be furnished by the Bureau of Mines. Another one-third can, no doubt, be obtained from South America, leaving the balance to be supplied from other sources.

Supply Is Needed from Low Grade Deposits

For this manganese it is necessary to resort to ores which cannot be milled, which are low grade and which have never been treated or considered as a source of supply under normal conditions. Such ores occur in very large tonnages in the vicinity of Artillery Peaks, Ariz.; near Chamberlain, S. Dak., and in the Cuyuna Range, Minn. They average from 5 percent to 15 percent manganese and must be treated by hydrometallurgical methods, or possibly, in the case of Chamberlain nodules, by smelting. The cost for plants and treatment will necessarily be high when judged by pre-war standards, and it is questionable whether any of these operations can survive the emergency, but

if successful methods of treatment can be devised, as seems probable, the manganese needed to make up the deficiency can be obtained from such ores, however long the emergency may last.

The Artillery Peak deposits occur in a mesa in the foothills of the Artillery and Rawhide Mountains in western Arizona near the Bill Williams River. They are about 50 miles from the Santa Fe Railroad. The mesa is deeply eroded, exposing the edges of the manganiferous beds. There are three types of ore, viz, rather friable sandstones and conglomerates, clays including mudstone, and a hard cemented ore which is a modification of sandstone ore. The first two types comprise the unaltered syngenetic deposits, whereas the third type has been cemented and locally enriched, giving rise to higher grade bodies. It is estimated that there are probably 10,000,000 tons of ore at a grade of 10 percent, or about 50,000,000 tons at a grade of 5 percent manganese. The ore would have to be mined by underground methods and must be treated by leaching. The minerals are mainly pyrolusite with small amounts of psilomelane. The gangue is comprised of quartz, chalcedony, feldspar and calcite. A typical analysis is 10 percent Mn, 56 percent SiO_2 8 percent Al_2O_3, 2 percent CaO and 1 percent Fe. The phosphorus is very low. The manganese minerals are almost completely soluble in SO_2 and dilute sulphuric acid and the ore may be leached either by percolation of the coarse ore or by fine grinding and agitation. The solution of manganese sulphate, upon evaporation, yields a salt which may be decomposed by calcining to manganous oxide and SO_2 for re-use in the process. The oxide after sintering becomes a high grade concentrate suitable for smelting to ferro-manganese.

South Dakota Deposit Is Large

By far the largest known deposit of manganese occurs near Chamberlain, S. Dak., in a 40-ft. bed of shale which outcrops for 60 miles along the Missouri River. The manganiferous bed is said to underly an area of about 1,500 square miles. The manganese occurs in concretionary carbonate nodules that average 16 percent manganese and constitute about 6 percent of the shale. The shale, therefore, averages only about 1 percent of manganese. The quantity of manganese is enormous and it has been estimated as high as 800,000,000 tons. However, the greater part of the shale bed is covered by about 150 ft. of barren material and this could not be mined at a reasonable cost considering its low grade. There are, however, about 50,000 acres which are free from overburden and could be mined by electric shovels. The nodules may be separated from the shale, after weathering or drying, by screening and washing, and experiments to see what can be done on a large scale are now being made by the Bureau of Mines.

The nodules themselves are from 1/4 in. to 6 in. in size and analyze about 16 percent Mn, 11 percent Fe, 15 percent CaO, 2 percent MgO and 15 percent SiO_2 plus Al_2O_3. They could be smelted to a metal intermediate between ferro-manganese and spiegeliron running about 45 percent Mn if it were not for the presence of about 0.4 percent of phosphorus which enters the metal and contaminates it to the extent of 1.5 percent, thus making it unsuitable for use in the manufacture of steel. If the metal is partially oxidized or sulphidized, the manganese may be separated from the phosphorus which remains in the iron. In this way a manganese concentrate might be made suitable for smelting to ferro-manganese. It has also been proposed to treat the nodules with sulphuric acid and bake the resulting mixture of sulphates in order to render the iron insoluble. The calcine, upon leaching with water, yields a solution which contains manganese sulphate and may be made substantially free of phosphorus. Recovery of manganese oxide would be by evaporation and calcination. This method would be very expensive because of the large consumption of acid by lime and magnesia.

Cuyuna Manganiferous Iron Ores May Be Further Developed

In the Cuyuna Range in Minnesota about one and one-half million tons of manganiferous iron ore are produced annually. After washing, the ore contains from 6 percent to 10 percent Mn, 42 percent to 46 percent Fe, 6 percent to 10 percent SiO_2 and about .25 percent P. These ores are generally brown in color and are quite soft. The bulk of the manganiferous iron ore mined at present is the brown ore. Reserves are estimated at 20 to 40 million tons. Black manganiferous iron ores contain 10 to 20 percent Mn, 30 to 40 percent Fe, 10 to 20 percent SiO_2 and .06 to .18 percent P. The reserves of these ores are not large. They have been used to some extent for the production of spiegeleisen, notably during the last war. It is not proposed to use either of these ores for the production of high grade manganese concentrates, partly because the brown ores are not well adapted to the type of process which would have to be used and partly because the manganese is already being used to good advantage along with the iron.

The class of material from which it is proposed to produce a concentrate during the emergency is not now considered ore as it contains too much silica and too little iron and cannot be concentrated by mechanical means but runs higher in manganese than the brown ores. According to one authority, a body of this ore several hundred feet wide and of unknown depth may be traced for a number of miles and is said to average from 9 to 10 percent manganese, 25 to 35 percent iron and similar percentages of silica. Phosphorus runs from .05 to .10 percent. The possible tonnage in an ore body of such dimensions is obviously very considerable. Estimates ranging from 10 to 30 million tons and over have been made by various authorities. Assuming that a successful treatment process can be developed, this belt can probably supply a good part of the manganese requirements during the emergency.

The ore is generally dark brown or black and has about the hardness of lime rock. It is a mixture of ferruginous slate and chert containing silica but very little lime or magnesia. The manganese minerals are predominantly oxides of manganese with some carbonate. The manganese can be readily leached and an effort is now being made to develop a process which can be used during the emergency. Hydrometallurgical processes generally require a large outlay of capital, and while production costs may not be unreasonable when considered in the light of current needs, they are pretty sure to be out of line with the prices at which foreign ores will be offered after the war is over. However, the oxide or concentrate from such a plant can be made very low in silica and phosphorus and correspondingly high in manganese and thus should command a premium.

All These Sources May Solve the Manganese Problem

From what has been said, it is apparent that the manganese problem is not impossible of solution. There appear to be abundant ore supplies,

although of rather low grade. The mining of ores presents no serious problems, although in the case of Chamberlain very large tonnages of shale would have to be handled for the production of any considerable part of the nation's requirements. The problems are chiefly metallurgical, requiring the adaptation of various known methods of concentration, smelting and leaching to the peculiarities of manganese metallurgy. The adaptation of such processes on the required scale is by no means easy, and the design and construction of the necessary plants cannot be done on short notice, as in many instances it must be preceded by intensive metallurgical and chemical studies. However, the outlook appears favorable for obtaining the manganese essential to our steel makers without going outside of our own boundaries and of the Western Hemisphere.

VANADIUM, TUNGSTEN and CHROMIUM

THE ores of tungsten and chrome have always been strategic minerals; that is, the sources of supply are wholly, or in considerable part, outside the continental limits of the United States. Continued receipt of supplies so situated will depend upon keeping the sea lanes open to distant ports and the political control in the countries of origin. The weak position of this country with respect to certain of the necessary war supplies was forcibly demonstrated during the last war and there has been almost constant agitation since that time to improve our position by accumulating emergency stock piles and by encouraging the development of new sources of supply in our own country.

Unfortunately, the agitation for the accumulation of stock piles bore no fruit until it was too late, but fortunately, until Japan declared war the sea lanes mostly were kept open, although there was some rearrangement of routes taken. The political control in the countries of origin remained favorable with respect to chrome, but China kept up reduced shipments of tungsten under great difficulties.

In 1938 when the Advisory Commission to the Council of National Defense made its first report on vanadium it was not considered a strategic metal and was classified as critical. We of the subcommittee investigating the vanadium situation were entirely too pessimistic about the country's capacity for using vanadium and considered that production facilities could be installed to meet the assumed emergency requirements. There has been a greater increase in the consumption and vanadium is now also considered as a strategic metal.

Consumption of Tungsten Has Increased Enormously

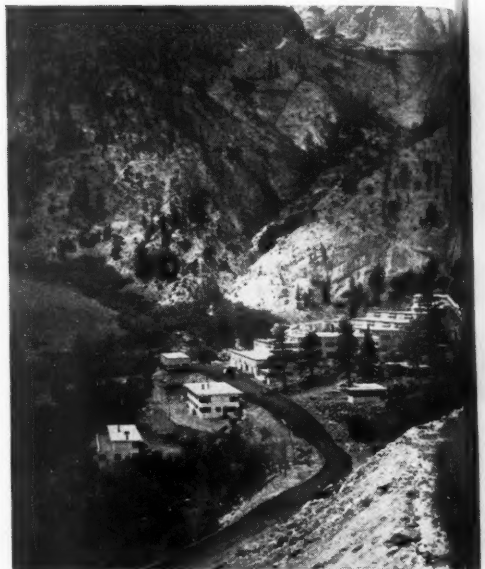
The consumption of tungsten has been exceedingly erratic and varies directly with the country's industrial activity. Its principal use is in high-speed tool steel containing 18 percent tungsten which is fashioned into metal cutting tools. It is not difficult to understand the enormous increase in tungsten requirements at this time when all industry is turning to war work. Every machine tool in the country is busy cutting some kind of metal.

In 1939 we used about 5,000,000 pounds of tungsten metal; in 1940 consumption was about 10,000,000 pounds, and in 1941, consumption has been estimated at the rate of about 18,000,000 pounds annually.

The domestic production of tungsten has increased rapidly in the last few years. In 1936 and subsequent years the approximate production was:

1936	2,485,893
1937	3,331,020
1938	2,897,036
1939	4,080,024
1940	5,062,199

In 1941 the total was probably about 6,500,000, and in 1942 this total will be considerably exceeded.

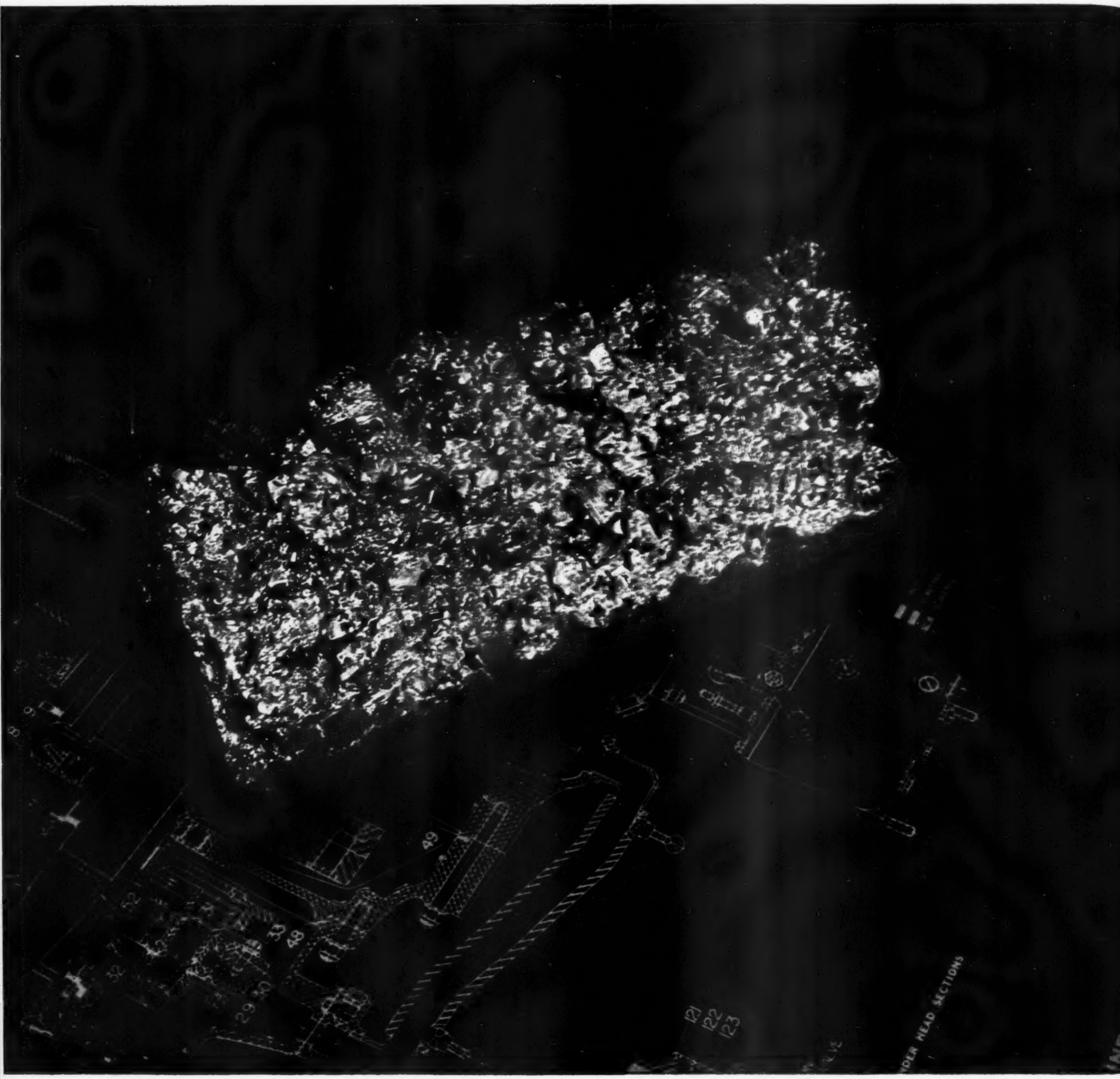


Tungsten plant of U. S. Vanadium Corp., at Pine Creek, near Bishop, Calif..

There are a number of new producing properties and some of the regulars have increased their production, but most of the estimated increase for 1942 is due to increased production facilities by the Nevada-Massachusetts Company at Mill City and Golconda, Nev., by the United States Vanadium Corporation at Pine Creek near Bishop, Calif., and the new mine of the Bradley Mining Co. at Stibnite, Idaho.

Flotation Now Being Applied to Tungsten Ores

The outstanding development in the domestic tungsten industry is the tendency toward flotation in concentrating the ores. The principal domestic tungsten production is from the so-called contact metamorphic occurrences of scheelite, the calcium tungstate mineral. These ores yield a low recovery by orthodox gravity methods. It has long been known



American Cyanamid Company

Declaration of Independence

This block of metallic magnesium from a new American plant symbolizes America's expanding production of strategic metals and its growing independence from sources which can no longer be counted upon to supply the increasing needs of American industry. Even before this page is printed, magnesium metal from this new source may be winging its way over a trackless ocean as a vital part of a Flying Fortress!

Magnesium is only one of many strategic metals which must be made available in undreamed of quantities. Not only metals such as Tin, Chromium and Tungsten not previously produced in quantity by American concentrators, but also American production of metals and non-metallics like Copper, Manganese, Zinc, Iron, Lead, Nickel, Mercury, Mica, Graphite and Garnet must be increased quickly and to unprecedented quantities. This can only be done by using the most efficient modern concentration processes.

Most efficient within its field of application is Heavy-Media Separation (Sink-Float), alone or in combination with froth flotation. When designed from experience gained on large-scale operations and after adequate test work in a well-equipped ore-dressing laboratory, Heavy-Media Separation plants can be built quickly and inexpensively. Being almost entirely assembled from standard units of milling equipment, they can be put into commercial operation with a minimum of lost-time and with operating costs lower than any other modern concentrating process. Particularly because a wide variety of heavy media—both ferrous and non-ferrous—can be used, Heavy-Media Separation has great scope and flexibility of application.

The addition of Heavy-Media Separation to an existing flow scheme offers a proven, low-cost method of pre-concentration of mill feed to produce larger metal-output from existing concentration equipment, or, an economic process for concentrating sub-ores and waste products hitherto regarded as too low-grade for treatment. In addition, Heavy-Media Separation may produce savings in mining costs by permitting less selective and lower cost mining methods. Laboratory and mill results indicate that Heavy-Media Separation may have wide applicability in producing directly a marketable concentrate. This should be particularly interesting to producers of strategic non-metallics.

To determine the economic application of Heavy-Media Separation, froth flotation or combinations of these processes, Cyanamid offers the entire mining industry the services of the expanded Cyanamid Ore Dressing Laboratory, the experience of Cyanamid Field Engineers and its practical operating background gained in treating millions of tons of diverse ores by these processes.

A new edition of Ore Dressing Notes—now in preparation—describes the Heavy-Media Separation Processes offered by Cyanamid. A copy will be sent upon request.

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that a high-grade flotation concentrate can be made from scheelite occurring in quartz veins; but the contact metamorphic ores yield an impure low-grade concentrate containing a mixture of all the calcium minerals present as an ore constituent, including limestone, apatite (calcium phosphate), and phosphorus, the most dreaded and serious of impurities.

To utilize the overall high recovery from the contact metamorphic ores accomplished by flotation, it was necessary to devise a method for further beneficiating these low grade flotation concentrates. Successful chemical methods have been perfected and put into practice by both the Nevada-Massachusetts Company at Golconda, and U. S. Vanadium Corporation at Pine Creek. This development renders available low-grade ores heretofore not considered as commercial. In my opinion, the United States can be made self-sufficient in respect to tungsten requirements even in wartime, if given money and time enough to develop the properties and make the required milling installations. We have the tungsten resources but need continuation of the present tariff protection of $8 per unit.

Tungsten Importations (in pounds)
First Six Months of 1941

	Mexico	Argentina	Bolivia	Peru	China	Australia	Others
June	31,588	46,923	215,675	38,368	690,919	2,912	13,246
May	.....	14,236	314,586	16,294	848,439	6,442	8,116
							444
April	1,557	14,244	322,133	23,387	363,458	10,931	5,894
March	.....	76,183	509,236	.....	221,139	3,591	2,574
February	30,159	105,052	424,587	24,388	91,170	2,394	.....
January	1,465	78,352	292,374	78,861	11,557	19,212	.....
Total ...	64,769	334,990	2,078,591	181,298	2,226,682	45,482	30,274

	Siam	Un. So. Africa	Belgian Congo	Portugal	Malay
June	.....	.....	.....	.....	.....
May	122,226	14,336	2,561	.....	.....
April	61,985	6,364	.....	4,000	4,000
March	10,566	45,038	.....	13,542	19,175
February	92,803	3,990	.....	34,594	8,000
January	114,423	6,974	.....	42,950	.....
Total ...	402,003	76,702	2,561	95,086	31,175

TOTAL

June	1,039,631
May	1,347,680
April	817,953
March	901,044
February	817,137
January	646,168
6 months	5,569,613

Sources of Import Have Changed

There have been changes in the sources of our imported tungsten. In 1941 China, although still the chief source of imports, was hard pressed to get her production to market. With seaports closed she has had to resort to the tortuous Burma Road with Japanese bombs rendering the task difficult.

For the first six months of 1941 tungsten imports were, in round figures, 5,600,000 pounds, in part from the sources as shown in the accompanying table (from Foreign Trade Statistics, published by the Department of Commerce).

As noted in this table there are some new faces as sources for tungsten ore imports. We formerly received very little Bolivian tungsten, as it was mostly exported to Europe and did not fit our requirements. We used high-grade ore directly in the smelting process but, since the war, we have been glad to get the production from Bolivia.

The Union of South Africa was not a large source of supply for us and very seldom any came from Portugal; yet in the period noted the latter sent us 95,000 pounds. There is a reason for this; sometimes they like the dollar exchange, and they have more freedom in their trading.

As a rule tungsten is shipped in small lots of 25 tons or less; before this emergency a large shipment would be 500 tons, generally speaking.

The Metals Reserve Company made contracts with Bolivian producers and China, and we loaned large sums to China (about $90,000,000) which is to be repaid in tungsten ore, antimony and tin. Contracts were made for the entire output of Bolivia. It can readily be seen that if the United States or an agency of the United States should purchase all of the supplies from the regular sources upon which industry relied, industry could not be expected to go out and find new sources of tungsten supply. Therefore, instead of putting the tungsten into stockpiles they diverted, as needed, arrivals into industrial channels.

The price of tungsten did not vary much during 1941. With the large Government purchases from China and Bolivia, and the diverting of this into industrial channels, the Government established the price. The supply was turned over at cost.

Use of Chrome Ore Has Likewise Increased

Like tungsten, the use for chrome ore varies with industrial activity. Consequently there has been a sharp increase in the requirement during the past couple of years. Prior to 1940, with the exception of 1937, the imports amounted to a little over 300,000 tons annually, but in 1940 the imports amounted to 658,000 tons, and at the end of 1940 the country was consuming chrome ore at the rate of 600,000 tons annually. The consumption in 1941 is estimated at an annual rate of between 700,000 and 800,000 tons. Fortunately, the chrome ore was available.

Domestic production has been negligible since the last war and until recently the supply has come from abroad. During 1940 the origin of imports was as follows (figures from the Minerals Yearbook for 1940):

	1940	First six months of 1941
Africa	285,000	165,000
Cuba	52,000	62,000
Greece	14,000	.....
India	33,000	7,000
New Caledonia.......	43,000	20,000
Philippine Islands....	157,000	100,000
Turkey	70,000	32,000
Brazil	......	3,000
Miscellaneous	......	4,000

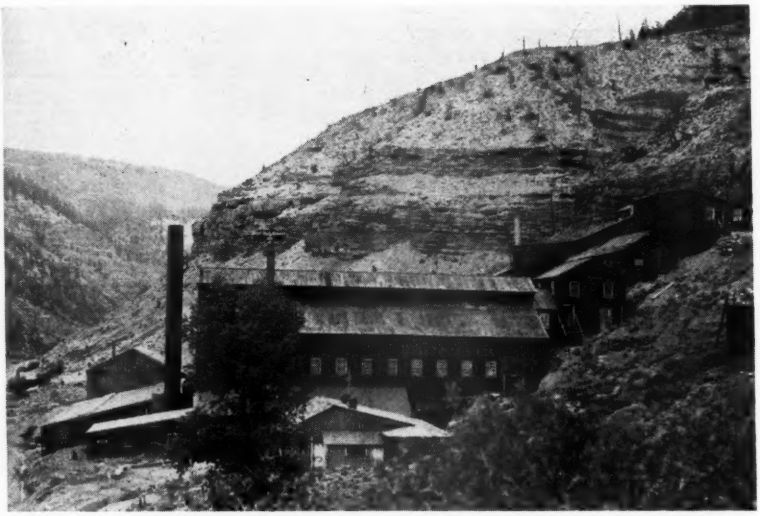
Most of the chrome ore that is being produced today comes from known occurrences that were worked during the last war. There have been no new discoveries of any great importance, though there is, of course, the development in Montana. This occurrence is 20 or 30 miles long, extending from the Boulder River to east of Stillwater; no production of any consequence was made here dur-

ing the last war. The Anaconda Copper Mining Company is building two plants in Montana and the production of chrome ore concentrates will about equal the company's production of manganese. The Vanadium Corporation has undertaken a similar development at Red Lodge which is a little east of Ben Bow, the easternmost property that Anaconda has been equipping.

Chrome Industry Needs Intensified Prospecting

Future domestic production cannot be predicted. We don't know what we can produce because we have no large ore bodies, and no developed mines. What is needed in the chrome industry of the United States is active prospecting. It is necessary now to develop small, irregular occurrences; sometimes these contain a few tons, sometimes a hundred and sometimes, if one is lucky, maybe a thousand. I believe some larger lenses at Dunsmuir, Calif., contained between 20,000 and 30,000 tons; these were mined during the last war. Hundreds of such bodies must be mined in order to obtain production of any consequence.

The amount of chrome ore to be moved to this country requires a lot of ships. The problem is in the same class with that of tungsten, only more so. The greater the number of units exposed the heavier the losses are bound to be in case of trouble. That problem is always with us.



Vanadium mill at Vanadium, Colo.

Vanadium Supply Is in Better Position

The apparent consumption of vanadium in 1940 was about 3,300,000 pounds. In 1941 the current supply was satisfying the demand, and the consumption was about 4,000,000 pounds. One-half of the vanadium consumed in the United States comes from Peru and these imports amounted to about 2,130,000 pounds in 1939 and 2,574,000 pounds in 1940. For the first six months in 1941 the imports were 2,430,000 pounds. These shipments from Peru will probably come along uninterruptedly, since there is not much chance of sea lane interference between South American countries and the United States.

The domestic production has been increasing and was, in all forms of vanadium ores, in 1939 about 1,777,000 pounds, and in 1940 about 2,015,000 pounds.

To meet the estimated requirements production capacities are being enlarged. The Vanadium Corporation plant at Rifle, Colo., has been enlarged and a new plant is being built; also one at Naturita, and possibly there will be other plants in southeastern Utah. By the first of this year these developments had about doubled the domestic production capacity.

ANTIMONY in 1941

By R. G. HALL
Metallurgical Engineer
San Francisco

As usual, the amount of metallic antimony produced from ores originating in the United States during 1941 was insignificant. There is no available record of production but there was probably little gain over 1940.

In 1939 there was considerable antimony content in the gold concentrates of the Yellow Pine mine. In 1940 this declined to an insignificant figure due to a decrease in the antimony content of the ore.

Yellow Pine Mine Has Notable Reserves

In 1941, however, the conditions at that mine again changed. Discovery of a lode containing a notable content of scheelite was made, and before the end of the year had been opened for production. This ore was found to contain a very significant quantity of stibnite which is recoverable without radical change in the methods of treatment. The discovery of this lode had no great effect on the domestic production of antimony for 1941, but by the end of the

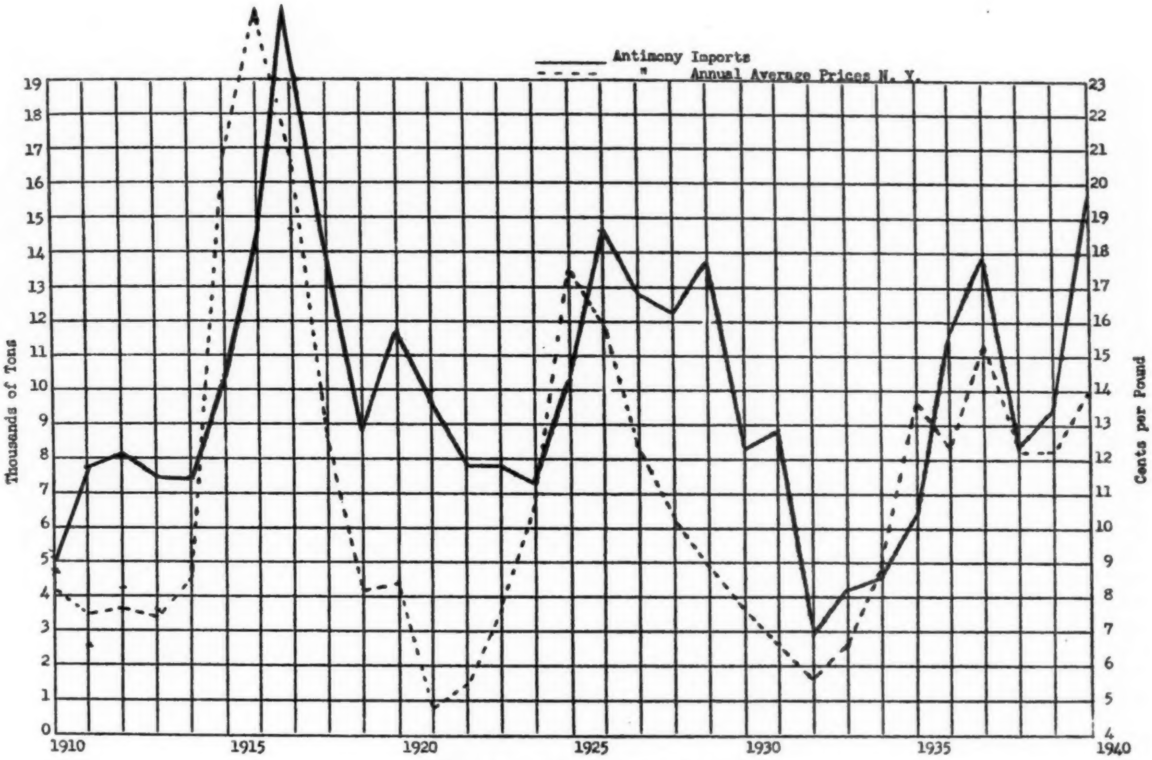


Chart of antimony imports and prices

year some 250 tons of concentrates were being made monthly, and 1942 will bring this mine to an antimony production which should go far towards supplying the United States needs in peace times.

Another mine in the same neighborhood, Valley County, Idaho, produced in 1941 several cars of 50 percent antimony ore which were shipped to Texas for smelting. Some other districts, notably in Nevada, produced shipping grade ore, and it is said that at present prices of antimony there is promise of developing a number of prospects in the intermountain states into mines.

However there are few deposits of antimony ore known and operated in the United States where there are other minerals of economic value, except those of Valley County, Idaho. The ores of the Stibnite district, however, contain a variety of valuable and recoverable minerals, sometimes exceeding the value of the antimony. Gold, silver, antimony and tungsten are now being produced from the same ores, and nearly all of the ores have two or three of those mentioned. The extent of this deposit and the extensive mineralization give great promise for the future of antimony production in the United States.

The production of electrolytic antimony from the tetrahedrite ores of the Coeur d'Alenes by the Bunker Hill & Sullivan Mining & Concentrating Co. continues, and the local supply of concentrates is also being supplemented by concentrates from the Yellow Pine mine.

Mexican Ores Are Imported

The plant of the Texas Mining & Smelting Co. continues to produce metallic antimony and oxide for the most part from Mexican ores, although it also receives some ores from Idaho and Nevada and perhaps elsewhere.

The Minardi plant near Los Angeles has been acquired by the Harshaw Chemical Co. of Cleveland, who will continue to operate on the Livingstonite ores of Mexico, probably supplemented by concentrates from Idaho. This firm is also a large manufacturer of oxide at their Cleveland plant. The source of raw material for that plant since the failure of the Chinese supply is said to be Bolivia.

In Canada the Consolidated M. & S. Co. at Trail is producing electrolytic antimony from the electrolytic anode slimes of the Betts lead refining tanks.

Antimonial Lead from Bolivia and Mexico

Antimonial lead production as usual followed the production of desilvered lead. This alloy usually constitutes about 10 percent of the total lead production and for 1941 will amount to about 60,000 tons. On the usual basis of calculation (10 percent antimony) this would indicate about 6,000 tons metallic antimony.

Imports for the year 1941 came almost entirely from Bolivia and Mexico, the imports from China having almost ceased. Substantially all of the imports were of ores.

Prices of antimony (American brands) continued at \$14 per 100 pounds New York warehouse, or \$13 Texas plant in bulk carloads. Quotations on Chinese brands were nominal and did not to any extent represent transactions.

Demand for Antimony Fluctuates Widely

The accompanying graph indicates that the demand for antimony is extremely fluctuating. Analysis of the statistics does not show that this fluctuation is much if any greater than in the other non-ferrous metals.

The high peak of World War I is not likely to be duplicated in this or future wars. The use of shrapnel with balls of antimony lead was then common, but shortly this was discontinued in favor of steel shells filled with high explosives. So far as I know the use of the old type of shrapnel has been discontinued.

The curve of antimony imports from that time onward continued to follow industrial development. War demand has its effect to a large extent, as it has also in the case of lead. Zinc and copper are directly and largely of use in munitions, lead and antimony to a much less extent. Industrially both the latter metals are greatly influenced by war conditions.

Replacement Uses Have Stimulated Demand

The replacement of tin oxide by antimony trioxide in the enameling of sanitary wear and enamels other than cooking vessels has created a great demand for antimonial ores. This demand will continue under normal peaceful conditions, and it may be expected that antimony metal and ores will not again fall to the lows of other years.

China is the great reservoir from which we have always drawn our antimony ores and metal, and at almost any price the market will offer. Will post-bellum conditions there restore the ante-bellum conditions of antimony mining in China? We do not know, but we can hardly imagine a United States production of ores of antimony under a competition of 5- to 7-cent metal. The total amount of antimony, metal and oxide, consumed in the United States is too low to encourage large operations which would reduce cost of production. The cost of carriage from the present known mines to the point of consumption is, and is likely to be, very high. So we may well ask, what of the future of antimony?

Review of Silver—1941

The review of the silver industry for 1941 was to have been written for the Journal by Walter E. Trent, mining engineer and monetary expert, and manager of the Rocky Mountain Metal Foundation in Washington, D. C. We regret to announce that Mr. Trent died on January 19. His death is a great loss to the mining industry, and to the cause of a metallic base for currency systems.

Mr. Trent's manuscript was left incompleted and we must therefore forego publication of the data which he was in the process of preparing.

POTASH and BORAX

By RUSSELL W. MUMFORD
General Manager
American Potash and Chemical Corp.

IN 1914, at the outbreak of the World War No. 1, Germany was the only country having a commercial production of potash salts for industrial and agricultural use.

During and following the war, substantial reserves of soluble potash salts were discovered and developed in the United States, Russia, Spain and Palestine. World production of potash in 1938 was about 3,000,000 metric tons of K_2O, of which the United States produced about 290,000 metric tons or 9.3 percent of the total.

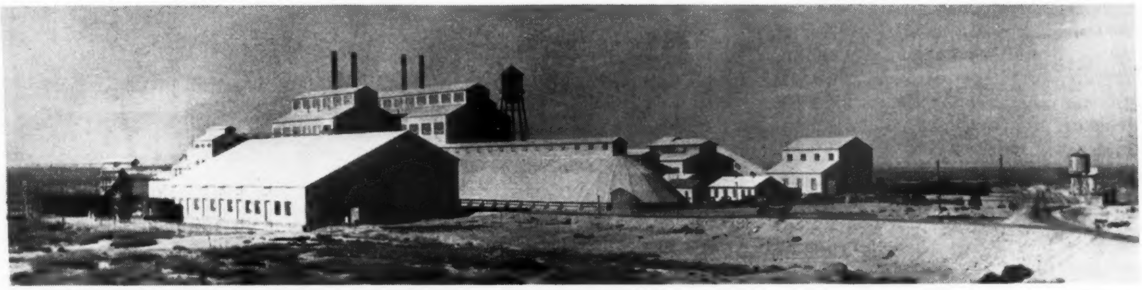
Known commercial reserves of soluble potash total enough to supply the world for about 3,000 years at the present rate of consumption. United States potash reserves approximate 1¼ percent of the world's total.

Sales in the United States of potash in 1940 were about 400,000 tons of K_2O. Prior to 1939 all potash salts produced in the United States were in the form of the muriate (KCl). Sales in 1940 included sulfate of potash, production of which was undertaken by domestic producers on a large scale in 1939.

United States Has Developed Self-Sufficiency in Potash

At the outbreak of the present war there was sufficient refinery capacity in the United States to supply around 75 percent of our needs at that time. As of 1941, the United States Bureau of Mines estimates that the refinery capacity has been increased to 475,000 tons per year. This capacity should care for increasing needs in this country and perhaps supply some for export.

The United States has developed a very active potash industry in the years since 1912. There are two main centers of production:



Refinery and warehouses, United States Potash Co., Carlsbad, N. Mex.

One of these is at Searles Lake, Calif., where the American Potash & Chemical Corporation has developed a large plant, manufacturing borax, soda ash, bromine, salt cake and lithium salts in addition to muriate of potash and sulphate of potash.

The other center is at Carlsbad, N. Mex. Here the United States Potash Company, the Potash Company of America, and Union Potash & Chemical Company have fine mines. The muriate ores analyze from 16 to 26 percent K_2O and are refined to make high grade muriate.

Imports Are Cut Off

The present war in Europe has shut off imports of potash from Europe. With the close of the war it is quite certain that exports of potash to this country will be resumed. Even with an expanding consumption of potash salts for fertilizer and chemical use in this country the close of the war may see an oversupply of potash in the United States. Pressure to obtain credits in the United States by foreign producers may well result in a lowering of prices.

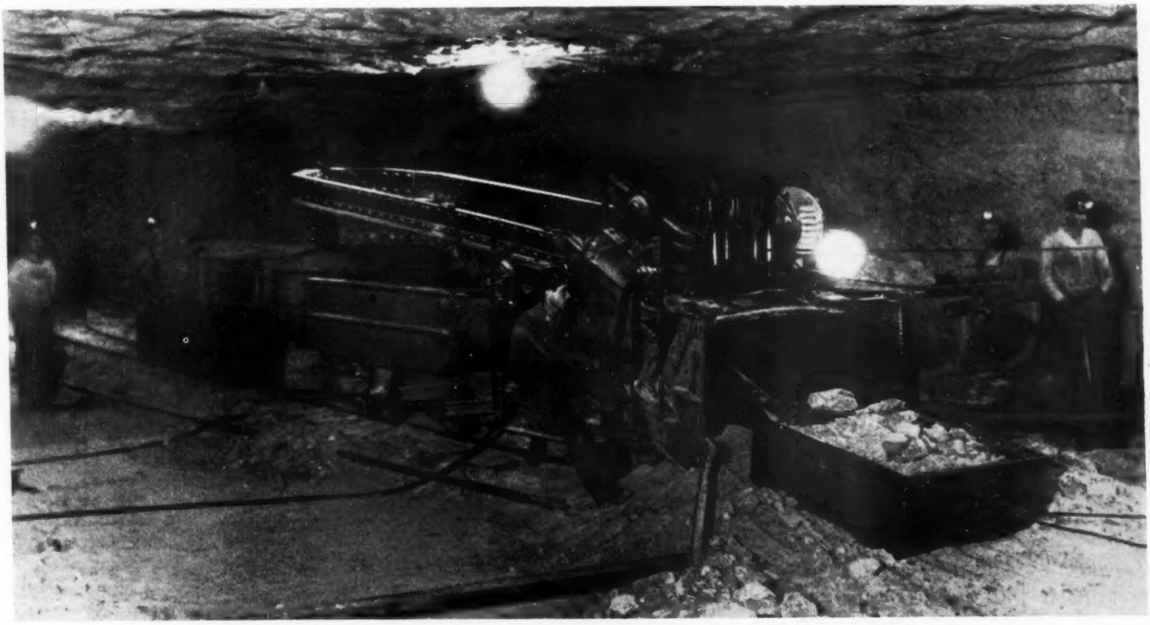
The chief interest in potash is for use as a plant food on soils deficient in potash. It is also very essential for supplying industrial and drug chemicals. Contrary to popular belief, potash is not used in preparing military explosives, except for the requirements of black powder, for bursting charges for certain shells, and for pyrotechnic shells, rockets, etc.

Chemical grade muriate of potash is used to make caustic potash, carbonate of potash and chlorate of potash. Chlorate of potash is mainly used for making matches and pyrotechnics. Caustic potash and carbonate of potash are used as such or for making other fine potassium chemicals for drug or industrial use.

Some of you may wonder why potash and borax are considered together in this discussion. The answer is fairly simple. At Searles Lake, Calif., potash and borax production are of economic necessity linked together. In addition one of the New Mexico properties is controlled by a borax producer. Hence, the economic community of interest between potash and borax.

California Is Largest Boron Producer

About 95 percent of the world's consumption of boron compounds is supplied by California from the Kramer deposits and the brines of Searles and Owens Lakes. Rasorite and tincal are both mined from the Kramer deposits. Run of mine ores there analyze from 26 to 30 percent B_2O_3.

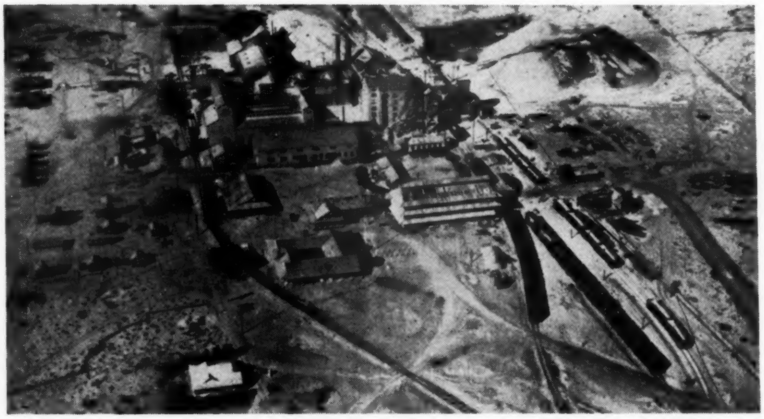


Underground loading with scraper hoist, United States Potash Company mine at Carlsbad, N. Mex.

At Searles and Owens Lakes the raw materials are borate bearing brines. At Searles Lake the borax is manufactured together with potash, soda ash and salt cake. At Owens Lake the borax is a by-product of the manufacture of soda ash.

The boron reserves of Searles Lake and Kramer are very large and ample to supply all the needs of the United States now and for many years in the future. Present commercial sources of boron other than those of California are the soffioni vapors in Tuscany, Italy, pandermite in Asia Minor and ulexite in Argentina. Tariff protection in the United States renders importation of boron compounds unlikely.

Additional potential reserves of borates are known in the United States, Chile, Argentina and Russia. These reserves occur largely in the form of calcium borates, such as colemanite, or sodium-calcium borate (ulexite). No other reserves of solid, soluble borates comparable to those at Kramer are known.



Plant of the Pacific Coast Borax Co., Kramer, Calif.

The largest single use of borax and boric acid is in the ceramic industry. Well over half the world's borax production is used for vitreous enamels, glasses and glazes. These uses, particularly for special glass such as optical and heat-resistant glasses, make borax and boric acid extremely important to the war program.

In 1940 the Bureau of Mines reports a production of 243,355 tons of boron products and a consumption of 179,042 tons with exports of 64,-313 tons all calculated to equivalent tons of borax.

SULPHUR in 1941

● *Industry is Meeting Demands*

By J. T. CLAIBORNE, Jr.
Vice President
Freeport Sulphur Co.

CONSUMPTION of sulphur in the United States during 1941 reached a new high. Domestic and foreign shipments during the year were about 3,325,000 long tons compared with 2,558,742 long tons in 1940, the previous top year, and 2,466,512 long tons for 1937, the record peace-time year.

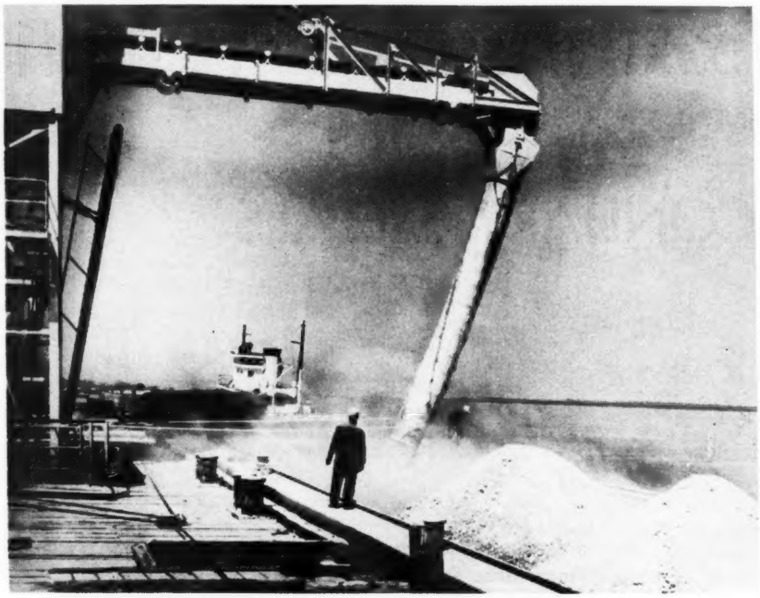
The industry not only succeeded in meeting in full the unprecedented requirements for defense and civilian production but accomplished it without any substantial reduction in above-ground stocks of mined sulphur, which, including stocks at distributing points and in hands of consumers, total over a year's supply for the ABCD powers at the current rate of shipments. Despite the intensification of the war, climaxed by the Axis attack on the United States, exports of sulphur were practically up to the level of the preceding year.

Industry Is Meeting War Demands

The satisfactory record of 1941 was in pointed contrast with the situation in 1917 and 1918 during the first World War. At that time the United States had been depending upon imports of pyrites to supply a sizable part of sulphur needs. When these imports were disrupted by sea warfare and ship shortages, a serious sulphur crisis threatened. Domestic production fell short of minimum needs.

Today, all that has changed. Even though in 1941 we were called upon for almost triple the amount of crude sulphur supplied in the peak year of World War I, the American sulphur industry satisfactorily met all requirements. This great quantity of sulphur was supplied, moreover, at no increase above the pre-war base price of $16 a ton f.o.b. mines.

The production of sulphur by the Frasch process was continued at the Gulf Coast mines without change in locations or numbers of mines throughout the year. Principal production came from the Boling Dome property of the Texas Gulf Sulphur Company, at Newgulf, Tex.; the operations at Grande Ecaille, in Louisiana, and Hoskins Mound, in Texas, by Freeport Sulphur Company; Jefferson Lake Sulphur Company, Inc., at Clemens Dome, Texas; and Duval Texas Sulphur Company, at Orchard Dome, Tex. Small amounts of sulphur were produced by surface mining in California and Utah. Production amounted to about 3,100,000 tons, an increase of some 13 percent over 1940, while shipments showed an increase of about 760,000 tons or about 30 percent over 1940.



Loading sulphur into a river barge at Port Sulphur, Louisiana

Foreign Trade Continues to Allied Powers

Foreign trade during 1941 was exclusively with the nations ranged against the Axis powers. Changes brought about by war moves cut off France in 1940, leaving the British Empire the chief foreign consumer of American sulphur. The release of exact figures for exports will be left to the proper authorities in order to avoid inadvertently giving aid to the Axis powers; however, American sulphur fulfilled its proper place in the American Arsenal of Democracy, and it can be stated here that shipments to the United Kingdom were considerably increased during the year, while losses due to enemy action, low in 1940, were reduced further by nearly 50 percent. Total foreign shipments for the year were not far below those for 1940.

Elemental Sulphur Is a Larger Factor

During the last two or three years elemental sulphur (brimstone) has been supplying about 70 percent of the requirements for sulphur in all forms in the United States. During 1941, however, the proportion supplied by natural sulphur has increased to at least 75 percent. This change has been due to a number of factors. The war has curtailed drastically the importation of Spanish pyrites, and while imports of Canadian pyrites have increased markedly and there has also been some increase in domestic production, the total pyrites use has fallen off.

Sulphuric acid production capacity was increased during the year by about 1,000 tons per day of 100 percent acid. A number of contact acid plants, formerly producing 98 percent acid, have installed the additional equipment necessary to produce fuming acid. The great increase in demand for sulphuric acid has not only caused construction of additional plant capacity but has also stimulated the demand for sulphur use in byproduct acid plants where additional productive capacity can be secured by increasing the gas strength by burning sulphur.

Sulphur Has Become An Indispensable Material For Industry

While sulphur is, of course, a vitally essential raw material for war, it is no more so than steel, gasoline, rubber, fertilizers, paper and the other countless things which war consumes and sulphur helps to make. First, with the displacement of black powder by smokeless powder and then with the displacement of acidification of Chile saltpeter by atmospheric fixation in the manufacture of nitric acid, sulphur's special significance as a war material has decreased. More and more, sulphur has become the indispensable tool of all industry, and as more and more steel, gasoline, rubber, etc., are required, so more and more sulphur is required.

The increase in sulphur consumption in the United States from 1940 was about 30 percent, while industrial activity as measured by the Federal Reserve Board index was about 27 percent. All branches of industry which consume sulphur participated in this increase, but the outstanding gains in sulphur consumption were in the chemical, pulp and paper, iron and steel, and rayon industries. The petroleum industry gained in its consumption of sulphuric acid primarily through a greatly expanded production of high-octane aviation gasoline. A number of acid alkylation process plants for producing aviation gasoline were constructed during the year.

Increased Use In Explosives Manufacture Is Slight

While the great expansion in explosives production has caused some increase in sulphur consumption as sulphuric acid, relatively this increase has been very slight. Sulphuric acid is still used to concentrate nitric acid; but, as is well known, sulphuric acid is no longer used in large amounts to produce nitric acid. Nearly the same quantity of sulphuric acid as before must, however, pass through the munitions plants to make one ton of explosive, and it then emerges as a large volume of dilute byproduct acid. Prior to the adoption of the atmospheric nitrogen fixation processes, this dilute acid was used to produce nitric acid from Chile saltpeter. The very large problem of spent acid disposal is being solved by purification and concentration of the acid for use in part by the munition plants and in part for use in other industries.

Rayon Industry a Large Sulphur Consumer

The remarkable growth of the rayon industry continues. Of all the rayon processes the viscose process consumes the largest quantity of sulphur. A new and largest viscose plant will begin production of 50,000,000 pounds per year shortly. The demand for rayon has been greatly increased by the suspension of silk imports and by the vastly increased use in all military equipment from truck tires to parachutes.

The pulp and paper industry in 1941 has been operating at peak capacity. In addition, the sulphite pulp branch of the industry, which is the chief sulphur consumer, has had not only to expand production of fine papers but has had to supply increas-

(*Continued on page* 81)

SCRAP METALS IN 1941

Non-ferrous SECONDARY METALS*

By F. H. WRIGHT
Assistant Mineral Economist
Secondary Metals Section
Bureau of Mines

The nonferrous secondary metals industry rose to a new peak of importance during 1941. As war production increased, substitution of one metal for another developed progressive shortages of aluminum and zinc, copper and brass, and finally lead. Price ceilings and rationing were applied to most scrap and secondary materials, and an educational program for conservation of scrap metals was promoted throughout industry.

FLOW of scrap to consumers suffered violent fluctuations during the year as the industry struggled to adapt itself to changing conditions and Government regulation. Operations practically ceased in March and April at both aluminum remelting plants and secondary zinc refineries owing to scrap scarcity. Even though recovery of some secondary metals was increased over the previous year, production capacity on the whole was in excess of available raw materials throughout most of 1941.

Curtailment of nondefense consumption, coupled with high specification requirements for most war materials, have tended to weaken the market for poorer grades of scrap, notably low-grade aluminum and red metals, but detailed analyses of all phases of the secondary metals industry are expected to supply the basic information necessary for full utilization of all scrap resources.

In addition to the country-wide collection of old aluminum, a series of regional meetings among auto wreckers resulted in increased flow of scrap in spite of the booming used-car market. Encouragement of direct return of segregated scrap to metal fabricators accounted for an actual increase in total scrap flow in the face of diminishing supplies from ordinary channels. Naturally, increases in volume of new scrap and metallic by-products of manufacturing were proportional to the expanded consumption of all metals during 1941, but final figures for some types of old scrap are expected to be less than in the previous year because uncertainties in replacing worn machinery or utensils tended to keep part of the normal supply of obsolete parts off the market.

Copper and Brass

Demand for scrap copper and brass in the secondary metals trade was vigorous from the very first of the year, but strengthened in March when pressure developed for an increase in the price of refined copper. Tension relaxed and scrap resumed its flow in April when the industry became convinced that copper would remain at 12 cents, but ingot makers and custom smelters experienced difficulties throughout the year in finding enough scrap of the quality needed to meet specifications for defense materials, partly as a result of heavy buying by foundries. Much of this competition was removed when priority control of scrap was established in October.

At primary plants production of refined copper from scrap dropped 23 percent from 117,669 tons in 1940 to 90,000 tons in 1941. Although final figures are not available, recovery of secondary brass and bronze in 1941 is expected to surpass that of the previous year.

Dealers' prices of unalloyed copper scrap were unusually close to refined copper prices at the start of 1941 and rose until the end of March, then fell off when an increase in primary copper price was refused in Washington. At the end of July scrap was again bringing almost as much as new metal. Maximum prices were set in August, with No. 1 copper wire at 10.75 cents, compared with previous sales at better than 11.50 cents. Ingot copper sold at 12.50 cents until August 12, when a ceiling was fixed at 12 cents. Maximum prices for brass mill scrap were imposed on July 22, and priority regulations were added in August to direct scrap back to the mills. Secondary brass ingot prices were held at reasonable levels throughout the year by informal agreements with producers, and alloyed copper brass mill scrap escaped formal ceiling regulation, although the year closed with all copper and copper alloys under complete priority control. Cancellation of nondefense bookings late in October relieved some of the pressure of unfilled orders at brass ingot plants.

Aluminum

An unprecedented demand for aluminum already apparent in 1940 was climaxed by rocketing prices in the first quarter of 1941. Both scrap aluminum and secondary ingot prices were brought back to proper relationship with primary metal when formal ceilings were fixed in March. Scrap

(*Continued on page 63*)

* Published by permission of the Director, Bureau of Mines, U. S. Department of the Interior.

Vitally Important to War Economy

IRON and STEEL SCRAP*

By HAROLD E. CARMONY
Secondary Metals Section
Bureau of Mines

THE iron and steel scrap business in 1941 attained a position of real industrial importance, ranking alongside other large enterprises for services rendered to the United States in a time of critical need. Publicity—in the form of headlines, news items, and editorials—which made the country scrap conscious, aided in this transformation. Formerly traders in iron and steel scrap were regarded as a necessary evil, but not as an essential cog in our industrial machinery. However, during the present emergency they are—and we hope for some time to come will be—considered to be performing an important role assisting in the maintenance of the high operating rate in the steel industry.

The function of the scrap dealers in 1941 consisted of furnishing to the steel mills and foundries the requisite raw materials so necessary to the production of 74,000,000 gross tons of steel as well as a sizable quantity of iron products. Since pig-iron supplies were fairly stable, this increase in steel production from the 59,805,000 tons made in 1940 required considerably more scrap, a large portion of which was supplied by the scrap trade. The importance of the role played by the scrap industry can only be discerned by scrutinizing the statistics covering the materials (ferrous scrap and pig iron) used during 1941 and comparing them with the statistics for 1940.

Output Reaches High Level

The output of iron and steel scrap for domestic consumption during 1941 reached the highest level in the history of the industry. Final figures are not available, but estimates place the 1941 output at about 55,000,000 gross tons, compared with 39,758,628 tons in 1940 and 32,434,407 tons in 1939. During 1941 the relative proportion of total scrap used in furnace charges was 4 percent greater than in 1940, while the proportion of pig iron used decreased 4 percent. The total increase in scrap used actually amounted to approximately 15,250,000 tons, while steel ingot production increased only 16,000,000 tons, showing the vital necessity of scrap to the steel industry. Of the 55,000,000 tons of scrap used during the year, 24,500,000 tons was purchased scrap and 30,500,000 tons was home scrap. These figures represent increases of 41 and 40 percent in the use of purchased and home scrap, respectively, as compared with the 17,395,000 tons of purchased scrap and 22,364,000 tons of home scrap used in 1940. Thus it can be seen that, in addition to the increased use of total scrap in furnace charges due to increased steel production, a supplementary burden was placed upon the scrap industry to provide enough purchased scrap to offset the relatively lower amount of home scrap used. These facts can be better summarized by stating that the amounts of purchased scrap, home scrap and pig iron used in 1941 for the record steel production were greater than the totals used in 1940 by 41, 36, and 15 percent, respectively. Consequently the increased use of purchased scrap was 5 percent larger than the increased use of home scrap, and 26 percent greater than the increased use of pig iron.

Maximum Prices Established

The price of No. 1 heavy-melting steel scrap at Pittsburgh, which was $23.75 per gross ton during the first week in January, decreased gradually
(*Continued on page* 64)

Pig-casting lead

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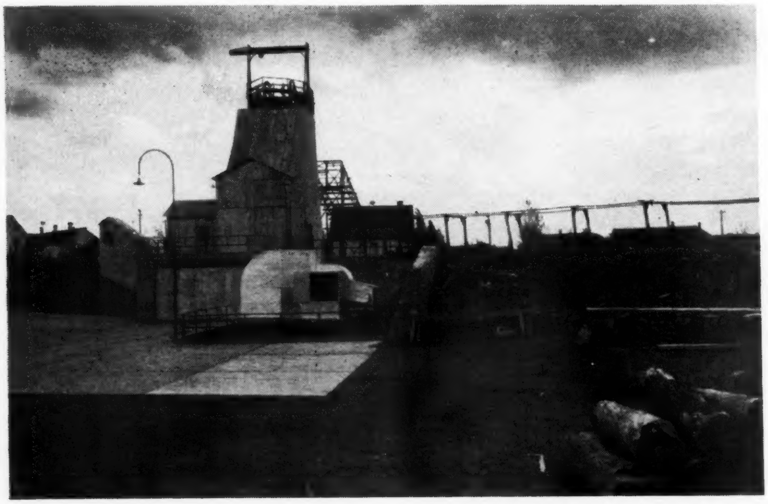
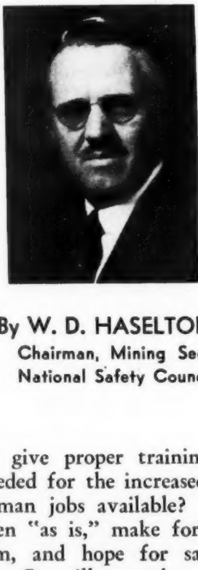


Ventilating fan at man and material shaft of the Sunday Lake mine, Pickands Mather & Co., Wakefield, Mich.

PHOTO FROM U. S. BUREAU OF MINES

METAL MINE SAFETY—1941

In times of stress, when production is pushed to the limit, safety education and safety consciousness must not be allowed to lag if the fatality rates are to be kept down. Mr. Haselton stresses the need of continuing a vigorous and widespread safety program.



By W. D. HASELTON
Chairman, Mining Section
National Safety Council

THE metal mines of this country were given a job to do in 1941 and did it well. Production and more production was the order of the day. Old capacities were stepped up and new mines opened. Shifts were doubled and tripled and a six-day work week was normal.

New men to meet the requirements came from various sources, but the most important one was from the young, inexperienced class. Fortunately for the industry, the increased activity of the late 30's, as compared with the early part of that decade, had resulted in some building up of forces and the training of new men at a time that was more opportune than the year 1941 would have been.

New Men Must Be Broken in Under Supervision

To meet the situation, it is quite customary to place the inexperienced men with old hands, sometimes with, but too frequently without, preliminary training or instruction. In some cases new men work on the surface until they feel at home and have shown the management what they can do. In other cases classes of instruction are held. In one mine in particular certain stopes are considered as training schools for new men, the inexperienced youth being placed there in charge of an experienced miner with accent on training rather than the number of tons produced. Whatever the method may be, some systematized breaking in of new and inexperienced young men should be followed.

It is unfortunate but probably true that in many cases there had been little effort made toward the development of new foremen during the past 10 years or so. With many mines down or on limited schedules, there was no incentive in the early 30's to develop foremen and, as operations increased during the last few years prior to 1941, there still were plenty of former bosses available to meet the increasing demand.

Now we are faced with a very marked increase in operations and consequent greater demand for supervisors. With the emergency upon us, are we too preoccupied with production to give proper training to the men needed for the increased number of foreman jobs available? Will we take men "as is," make foremen out of them, and hope for satisfactory results? Or will we take men from production and put them through a strenuous training course? The shortage of good foremen is now very marked in numerous mines and good ones cannot be developed over night. The proportion of men to bosses cannot be standardized even for similar types of mining, the factors being too variable. Perhaps 10 to 20 men per boss might be considered normal with the tendency toward the higher number, and in numerous cases away beyond that figure. Every effort

should be made to have potential foremen in process of development constantly. Such training should be carried forward under a program carefully planned and adhered to. It is not an easy job for a miner to assume the responsibilities of a boss, either with or without preliminary training, but certainly the training is of tremendous importance in making such a change successful. There are too many factors involved in such a transition to try to enumerate them in this article, but the factor of proper safety consciousness is outstanding.

Safeguards Against Mine Fires

Metal mines have done a very good job in recent years (including 1941) in the prevention of loss of life through underground fires; while the past year was afflicted with numerous serious metal mine fires, the loss of life from them was essentially nil. Evidently metal mining people learned much in connection with the occurrence of such disasters as those that occurred in the Pennsylvania mine in 1915 in Butte, Mont., with 21 deaths; the North Butte mine fire in Butte in 1917, with 163 deaths; and the Argonaut fire in California in 1922, with 47 deaths. At any rate, since 1925 the annual number of fatalities from metal mine fires has been approximately five, thus being a decidedly good record compared with the 10 years preceding 1925.

During the year there were about the usual number of cases of persons entering abandoned mines or inoperative sections of active mines without their having first given consideration to the matter of air. It is obvious that no entrance into such types of workings should be made without proper preparation. Abandoned workings should be bulkheaded off to prevent anyone from unintentionally entering them, as well as to deter deliberate entrance for the purpose of sabotage, which could easily be performed by starting a fire which would close down the active part of the operations.

There is still a lack of undertanding of the function of canister-type gas masks. It is evident that a campaign of education is needed to make known the uses and limitations of gas masks and to emphasize the hazard of their use in atmospheres of unknown gas content.

The existing war conditions make it imperative that extreme care be exercised in the handling, storage, and distribution of explosives. This is a difficult matter properly to care for, but the casual manner in which explosives are handled in peace times should not be condoned under war conditions.

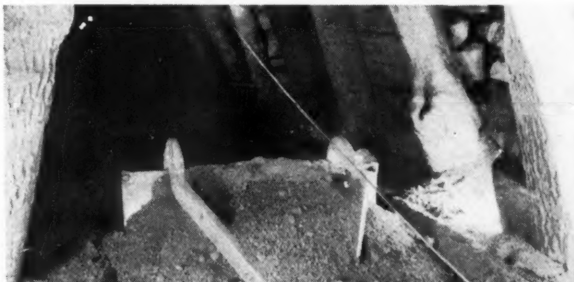
There have been some major tunneling projects under way during the year, including the largest tunnel in the world, where the effective regulations as to the use of explosives, removal of blasting fumes, the limitation of air dustiness, the requirements as to safety, etc., as carried out on this particular job and others indicate that speed in tunneling is not incompatible with the taking of reasonable precautions as to health and safety.

In all probability the national metal mine safety results for 1941 will show an increase in both frequency and severity rates, although no data are as yet available. The frequency is likely to be better proportionately than the severity rate, which has shown little progress for the underground metal mines in recent years. On the other hand, the open-cut mines have shown good reductions in both severity and frequency and are setting a stiff pace for the underground mines to meet. A number of districts will report statistics from underground mines that will not even closely conform to the above statement and they are to be commended for their good work in the face of the rather difficult conditions existing during the year.

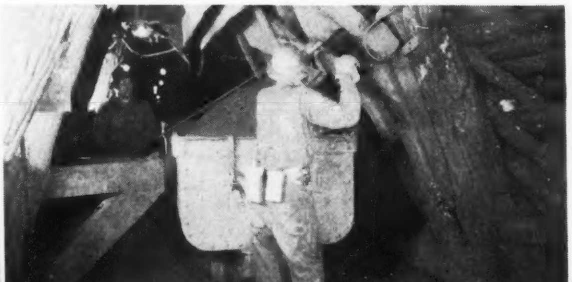
Safety Methods Must Be Further Improved

It is more true than ever before that the procedure of successful companies and districts should be carefully considered by the management of those mines whose experience is not good, in the confident knowledge that the adoption of proven safety methods will work for them as well as others. We are all faced with new conditions, and probably new methods are indicated to meet them successfully. The statement was made only a few months ago before the British Parliament that England had been plagued with an abnormal number of serious or fatal accidents which can be directly or indirectly attributed, in a great proportion of the cases, to the conditions accompanying the war. Such being the case with them after two years of war, can we not add sufficient effort now at the start of our crisis to offset to a marked degree the disadvantageous conditions with which the mining industry is faced, and which will become progressively worse?

We have all been reading statistics on the loss of time from accidents and they are not pleasant reading. When one measures annual foot injuries in terms of three battleships or 500 bombers we get a picture of the wide field of opportunity which awaits



Slusher operating in sublevel caving drift, Newport mine, Ironwood, Mich., Pickands Mather & Co.



PHOTOS FROM U. S. BUREAU OF MINES

Bumper block at chute loading station, Newport mine

intelligent and practical analysis and attack. When we picture a hypothetical 45 battleships sunk by the man-days representing all accidents for a year in this country it is not an invitation to do something about it—it is a challenge and an obligation which every citizen should accept as one of the "bits" he can do to help. The organized safety departments of the mining communities should be the pace-setters for the citizenry.

During the course of 1941 there evidently has been no letup in safety efforts on the part of the mining industry. Perhaps there has been a tendency to maintain safety programs in status quo while the rest of the operation has been materially expanded. This is not true everywhere and especially does it not apply to the operators who hold to the long-range viewpoint. War is a stimulus to many things, safety included. The men today are more safety conscious in all probability and would relish the opportunity for increased training. Unfortunately, however, the safety effort is handicapped to some extent by the Wages and Hours Laws; to what extent is not easily determined.

Rush for Production Must Not Interfere With Safety

During such times as these, when production is at a peak and when there is more than ordinary need for safety training, it is increasingly difficult to have men taken off production for classes in first-aid training and mine rescue and safety meetings. More than ever, because of the large number of new men on the job, is such training needed. The new man is a better man because of a few hours in a safety class. He has had aroused in him a safety consciousness which perhaps would otherwise be slow in developing. A few hours of safety instructions may be the means of avoiding an accident involving not only the new man but others as well, and resulting in a production loss of important proportions. Safety consciousness is more important than all the safety devices known to the industry—and that does not in any way belittle the value of safety devices.

There is increasing difficulty in getting delivery of certain items of safety equipment, although to date no serious handicap has resulted. It behooves us all to devote much attention to maintenance in order to prolong the life of safety items and operating equipment. Make sure that some certain person is responsible for maintenance and the equipment in his charge can be depended upon.

Underground safety meeting, Eureka mine of Castile Mining Co., Ramsay, Mich.

PHOTO FROM U. S. BUREAU OF MINES

New Men Must Be Safety-Educated

Another problem has been developing recently; namely, the effects of the availability of jobs to almost anyone applying for work. It means more jumping about of employes from mine to mine in the hope of finding the perfect place to work or the satisfaction of some personal whim. This places emphasis on the proper introduction of the new man to his working conditions and his education as to the company's attitude in regard to safety. It also means more difficulty in the enforcement of safety regulations and discipline in general. Discipline is a powerful tool and it is hoped that it will not be sidetracked for the duration because of the labor situation. Such action would be misguided. The discharge for proper cause of a man, or several men, and the loss of production represented by him or them, will be compensated for over and over again by the better attitude of the other men at the mine. Make your mine as nearly as possible one where good men will be content to stay and then make forceful use of carefully considered discipline when the occasion arises.

In the important Lake Superior Iron Ore District there was great activity during the past year, shipments exceeding previous high marks by 25 percent. The conditions commented on elsewhere were typical of this district. The mines met the heavy demand without particular difficulty, but the tempo of the district has been increased. The long-established, well-organized safety programs are being continued. There is more emphasis being placed on good ventilation and dust control. Underground lighting is very extensive, in spite of which the use of electric cap lamps is the general practice, so that men will never be working in their own shadow and will always have adequate light when working in the spots not well illuminated by the wired lighting. Such wired lighting quite generally involves the use of flood lights in working places. The use of hard hats and hard-toed shoes and goggles is practically standard practice. In a large number of the

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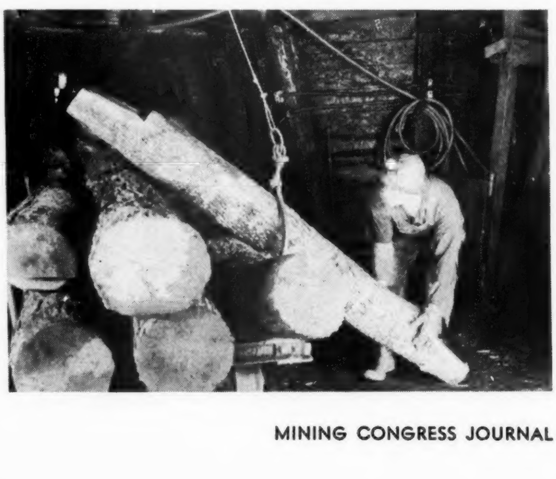


Loading heavy timbers with tugger hoist

mines goggles are worn for the full eight-hour shift, with exceptions only when conditions, in the opinion of the boss or some higher authority, are such as to make the wearing of goggles undesirable. In the mines following this practice it is probable that a 90 percent protection for the full shift is secured. Eye injuries are no longer of serious proportions, either in number or degree. Fire patrols are generously used following the close of the last shift before idle periods. Pulling of feeder switches by miners when leaving their places at the close of a shift is a standard practice. With the miles of wiring and the numerous accessories, electricity is the greatest of the district's fire hazards. This indicates extreme care is essential in selection of materials and in the installation and maintenance.

Metal Mines Have Been Free From Disasters

There have been no accidents of the disaster type in the metal mines during the past year. The disabilities and fatalities continued to involve individuals and small groups only at any one time. While this type of accident is not one that gains wide publicity, the sum total of them is impressive and disturbing. The mining industry as a whole will probably retain its unenviable record of next to the bottom in the comparison of all industries. This rating can be improved if all mine managements make a genuine effort to reduce accidents in their own operation. It should not be difficult to sell to them the idea of a dead-in-earnest campaign when experience has shown, as it has so many times in the past, that concentration on accident prevention saves money and lives and improves morale, and is a sure-fire method of countering to some extent at least the present rising costs of labor and materials.

In closing the writer wishes to refer again to the large number of young, inexperienced men being introduced into the mines; a highly desirable group of intelligent, American-born youths whose presence in the mines augers well for the future. From its ranks a few years hence will be drawn the all-essential foremen. To them all encouragement and assistance should be given, as they are the type of individuals who will appreciate that accident-prevention efforts yield generous dividends to themselves, their families and fellow workmen, as well as to the employers, and that the extra effort required is more than justified by the results that are bound to follow.

Nonferrous Secondary Metals

(*Continued from page* 58)

flow immediately dried up, and many remelters were forced to suspend operations on all except new scrap shipped direct from fabricators. Continued low scrap intake at secondary aluminum smelters in June brought an allocation control order designed to direct aluminum scrap to defense production. In spite of several lean months, secondary aluminum ingot production for the first six months of 1941 was shown by a Bureau of Mines survey to have been 27 percent greater than for a comparable portion of the previous year. Preliminary figures indicate that decreased production of secondary ingot in the second half of the year might bring the 1941 total to approximately the 1940 level or slightly higher.

Zinc

Sharp demand for scrap and secondary zinc was in evidence several months before the beginning of 1941, and zinc scrap prices in some instances surpassed primary metal quotations. Secondary smelters worked at capacity during the first quarter, consuming large stocks of galvanizers' dross and skimmings accumulated when galvanizing operations touched 84 percent of capacity near the close of 1940.

Maximum prices for scrap and secondary slab zinc, in line with primary prices, were fixed by the Government in March, and a voluntary agreement was reached between the Advisory Commission to the Council of National Defense and the zinc trade whereby a certain percentage of each month's production was to be set aside in a pool for allocation to meet urgent defense needs. All distilled slab zinc, whether primary or secondary, was subject to pool requirements and the arrangement was made mandatory in July. Flow of zinc scrap and by-products slowed to a trickle while the industry accustomed itself to regulation, and sources of old zinc had been drained to such an extent during 1940 that recovery from old material during the first six months of 1941 fell 20 percent. In contrast, recovery of zinc from new scrap and residues increased 20 percent over the 1940 rate and brought total recovery of secondary zinc from zinc materials during the first half of 1941 to 74,032 short tons, a 12 percent increase over the half-year rate in 1940. Redistilled slab zinc production in the first half of 1941 was 33,692 short tons, which was 38 percent above that of a comparable period in 1940, but declined to about 28,055 tons in the last six months. Total production of secondary slab zinc in 1941 amounted to approximately 61,747 tons.

Primary zinc prices were held steady by voluntary agreement until October, when an official ceiling order permitted a 1-cent increase in order to stimulate production. A few days later maximum prices for scrap and secondary zinc were advanced to conform with primary prices and closed the year without further change.

(*Continued on page* 64)

Charging an anode furnace with compressed copper scrap

Lead

While it was assumed early in 1941 that lead supply would be adequate to meet all demands, low consumer stocks and increased buying soon created a backlog of unfilled orders. A threatened rise in the primary lead price brought a request for an unofficial ceiling at 5.85 cents toward the end of March, but secondary lead brought 6.50 cents to 7 cents throughout most of the year. Although lead from scrap refined at primary lead plants decreased from 16,588 short tons in 1940 to 14,000 tons in 1941, it is expected that total recovery of secondary lead will far surpass the records of the last few years. On November 4 both primary and secondary lead were placed under complete priority control and a 15 percent pool for allocation was set up in November and December.

Shortage of other metals was held responsible for the overwhelming demand for lead. Substitutions of lead for zinc, aluminum, and tin, and increased proportion of lead in solder and other alloys, were added to growing war production requirements. Priority control toward the end of 1941 assured the filling of war orders but left the prospect of filling civilian needs uncertain.

Iron and Steel Scrap

(Continued from page 59)

to $20.75 on February 11, as steel operations declined to 96 percent of capacity, then immediately gained to $21 the following week, at which point the price remained until the first week of April. Since the efforts of the Office of Price Stabilization to maintain voluntary control of prices were not entirely effective, the newly created Office of Price Administration, after a thorough study of the iron and steel scrap industry, on April 3 issued Price Schedule No. 4 establishing maximum prices for iron and steel scrap. Under this arrangement the price of No. 1 heavy-melting steel scrap at Pittsburgh was set at $20 per gross ton, at which point it was maintained throughout the remainder of the year. The established prices for other grades of scrap were based on the price of No. 1 heavy-melting scrap. The average price of No. 1 heavy-melting steel scrap for 1941 was $20.36, compared with $19.26 for 1940.

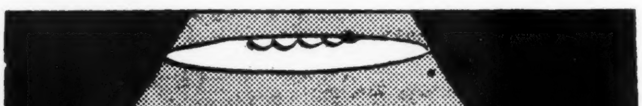
There were various minor revisions of this schedule throughout the year which included changes in export prices, additions of more basing points and modification of shipping point prices. On December 23 a major revision in the price structure was introduced with a view to increasing the collection of all kinds of scrap and to directing the flow of particular types to plants of consumers needing special scrap items. The revised schedule classified the various types and grades of scrap according to use and established maximum prices for each type of consumer. On October 11 the Office of Production Management issued General Preference Order No. M-24, placing iron and steel scrap under full priority control. Under this preference order allocation of scrap was inaugurated in a manner similar to the allocation of pig iron.

Domestic Stocks Decline

The quarterly surveys of consumption and stocks initiated by the Bureau of Mines in 1939 and changed in July, 1941, to monthly surveys, were expanded after the issuance of this general preference order to include all automobile wreckers, dealers, brokers, and all types of consumers, as well as every manufacturing plant that produced 50 gross tons or more of scrap during any month. These surveys indicated a consistent decline in domestic stocks of iron and steel scrap at consumers' and suppliers' plants and in transit from the 7,003,000 gross tons on December 31, 1940, to 5,104,000 tons on September 30, 1941. Final stock figures for the remaining months of the year are not yet available, but the general indication is that the amount of iron and steel scrap on hand will be lower. The reports received in these canvasses from the consuming industry throughout the year consistently showed the consumption of approximately 4,500,000 gross tons of scrap.

Exports Lessen

Due to export license proclamations that were issued during the latter part of 1940, exports of iron and steel scrap during 1941 from the United States were greatly lowered as compared with 1940 and previous years. Exports of iron and steel scrap for the first nine months of 1941 were 612,000 gross tons, excluding tinplate waste, circles, strips, etc., as compared with 2,393,000 tons during the same period of 1940, or a 74 percent decline. All of the scrap exported was limited to shipments to the Western Hemisphere and Great Britain under licensing made effective in October, 1940.



--THE CHARLESTON DAILY MAIL

..."Hah! Hoarding scrap metal, eh?"

Advances in MILLING METHODS—

● ***This month the Journal, in presenting reviews of each of the major branches of the mining industry, is fortunate in being able to present the subject of milling in four parts, each by an acknowledged authority in the field. Under the headings of Reduction Crushing, Fine Grinding, Coarse Concentration, and Flotation, the respective authors give a comprehensive review of new developments in milling methods.***

REDUCTION CRUSHING

By MAX W. BOWEN
The Golden Cycle Corporation

IN fine crushing, two factors normally make up the major cost. These are the charges for steel and power consumption and excessive costs can result from:

(1) Poor feed distribution.
(2) Choking or packing crusher cavity.
(3) Overcrushing of already crushed fines—poor elimination of fines ahead of crusher.
(4) Improper distribution of crushing action throughout length of cavity.
(5) Excessive ratio of reduction.
(6) Too wide an angle of nip.

These conditions may result in excessive steel wear, localized steel wear causing high scrap loss, high power consumption, excessive peak loads, unequal distribution of crushing stresses, overstressing of main shaft and gears, and excessive wear on gears and bearings.

The capacity of any given crusher is governed by its ability to discharge material. The finer a crusher is set, the smaller is the capacity that it will pass. The coarser the setting, the greater the capacity. The life of a set of liners in any crusher, in terms of tonnage through the machine, is in proportion to the setting at which same operates. The finer the setting, the lower the tonnage per set of liners. The coarser the setting, the greater the tonnage per set of liners. It is an established fact that liner costs per ton of ore crushed are higher in fine reduction than in the coarser stages of crushing. This is true for all makes and types of crushers.

The Cone Principle in Crushing an Outstanding Contribution

The introduction of the principle of crushing as used in the Symons cone crushers was universally recognized as an outstanding contribution to the treatment of ores. Because of the controlled feed, wide throw of crushing head, and the timing principle employed in the cone crusher, it afforded maximum range of reduction, as well as maximum capacity due to its ability to discharge crushed material readily.

The feed opening of a primary crusher must accept the largest piece in a feed varying over a wide range of sizes. For this reason it is impracticable to design a primary jaw or gyratory crusher with suitable crushing action throughout the entire cavity. Due to the excessively large feed opening, resulting in concentration of the crushing action at the lower part of the cavity, as much as 70 percent to 90 percent of the manganese steel members may be discarded as scrap.

This is also true, to a lesser degree, of intermediate crushers although there have been many cases where intermediate crusher cavities have been redesigned and notable improvements effected. Service in primary and intermediate stages is usually less severe than in fine crushers used for the final reduction. The difficulties encountered in designing special cavities for primary and intermediate crushers do not handicap these stages too greatly because of the comparatively lighter duty.

Manufacturers Continue to Improve Crusher Principles

The Nordberg Manufacturing Company have still continued to improve the mechanical details as well as the operating efficiency of their Symons cone crushers. As the writer is more familiar with the improvements and the applications of the Symons cone crusher, these improvements will be discussed more in detail. It should be borne in mind that the discussion in regard to the Symons cone improvements in operation might be applied in a general way to all fine reduction crushers; that is, basic principles as set forth in the introduction of this paper apply to all crushers

which use the principle of the gyrating crushing head.

During the past year steps were taken at Golden Cycle to lower per ton costs of third-stage crushing, through the introduction of newly developed "short" liners in the third-stage crushing section. The units used in this stage of crushing are three 5½-ft. fine bowl—only two in operation at any one time—Symons short head cone crushers operated in closed circuit with Hummer screens equipped with 4½ mesh screen cloth having openings of approximately 1 in. x .117 in.

Experimentation at the Mill Has Resulted in Increased Efficiency

The Golden Cycle Corporation, in cooperation with the engineers of the manufacturers of the short head cone crushers, devoted considerable time, study and experimentation to the problem of obtaining the correct crushing cavity to secure optimum crushing efficiency, uniform wear, and lower replacement costs. An improved "short" design of liner was introduced to determine experimentally just what results could be obtained. One factor, the ratio of reduction, remained constant. Our reduction ratio of approximately 3:1 is not excessive for a crusher of this type. Feed to short head crushers is the discharge from Symons standard cone crushers set at approximately 1-in. opening on closed side plus circulating load from screens. The short-head crushers are set at approximately 5/16 in. opening on closed side. The nip angle of the liners was decreased when the feed opening was made smaller; this was purely incidental as the original nip angle occasioned no steel wear due to slippage. Life of the liners was increased to a considerable extent and consequently scrap loss was reduced. Capacity was increased, as less trouble was encountered with choking caused by wet talcy ore. Screen analysis of the mill feed remained practically the same.

MILL FEED

Mesh		Ind.	Cum.
Plus	6	2.0	2.0
Plus	8	14.5	16.5
Plus	10	17.7	34.2
Plus	14	10.0	44.2
Plus	20	10.8	55.0
Plus	28	8.4	63.4
Plus	35	6.9	70.3
Plus	48	4.5	74.8
Plus	65	3.1	77.9
Plus	100	5.1	83.0
Plus	150	2.4	85.4
Plus	200	1.7	87.1
Minus	200	12.9	...

More Uniform Feed Improves Crusher Practice

At the same time that this work was being carried out, a redesigned feed plate was installed on the crusher to insure better feed distribution and control. This resulted in a more uniform feed, introduced the feed into the crushing cavity so the initial impact would always occur at the extreme top of the cavity, and prevented rapid cascading of small pieces to the lower part of the cavity before being subjected to an impact from the crusher head. Controlled flow through the cavity of any crusher is highly essential since surges and power peaks are eliminated and idling time reduced to a minimum.

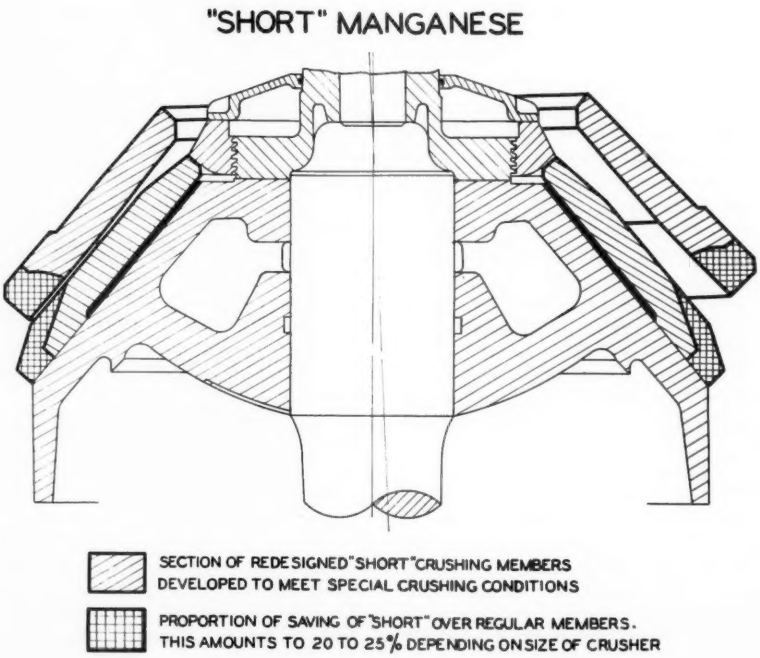
The benefits outlined above resulted from improved feed distribution and installation of the short liners, range of reduction effected, and the overall efficiency of the machine proved conclusively that the short liner cavity, as applied to the Symons short head crusher, was sound engineering practice. The short liners correctly adjusted the feed opening to the size of feed, eliminated overcrushing, and prevented formation of a choking zone by proper distribution of the crushing action throughout the length of the crusher cavity. The Symons short head cone as originally supplied by the manufacturer included the crushing action and standard cavity design most nearly approaching that which we finally arrived at as the ideal condition for our operation. Changes that were later made were in feed distribution and cavity design only. No major changes were required in the crusher.

This review of the work done at Golden Cycle is not offered as a cure-all for all crushing operations. In many cases inefficient screening, excessive reduction ratio, or other factors may prevent attainment of the conditions which we believe are required for good crusher operation.

These three short head crushers are driven by Allis-Chalmers synchronous motors directly connected through flexible couplings and in order to flatten out the excessive shock, each shaft has a fly wheel keyed to it, the fly wheel weighing approximately 1,800 pounds. Fifty tons of ore per hour are crushed to minus 4½ mesh (1-in. x .117-in. opening) by each crusher. Approximately 200 tons of ore pass through each crusher per hour and each crusher consumes approximately 140 h.p. or 0.7 h.p. hours per ton of ore through the crusher or 2.8 h.p. hours per ton of finished product. Cripple Creek ore has long been recognized to be exceedingly tough and hard to crush to the finer sizes.

The engineering department of the Nordberg Manufacturing Company is continually working with other oper-

Cross-section of shorthead cone crusher



ating organizations to improve the performance of their crushers. They advise that at Braden Copper the same type of redesign saved 20 percent in power consumption and effected a 25 percent reduction in liner weight. Phelps Dodge at Ajo have reduced their liner weights by 18.5 percent and power consumption by 10 percent in their Symons 7-ft. short head cones. Howe Sound's redesigned 5½-ft. short head cone liners at the Holden mill weigh 20 percent less and a saving of 10 percent has been made in power consumption. Several other organizations have used this method of adapting their manganese steel liners to a design suiting their particular conditions. All have increased the efficiency of their operations. Many more operators will follow suit.

Current FINE GRINDING PRACTICE and Recent Developments in Equipment

By ROY HATCH
Superintendent
Utah Copper Co.
Garfield, Utah

IN reviewing new developments and equipment in fine grinding, some recent changes have been influenced by the necessity of rapidly increased production. For the past few years a great demand for metals has been experienced, and to supply this need existing plant facilities have been operated for greater metal production. Generally this has not been achieved through increased metallurgical efficiency but by treating abnormally high tonnages with substantially the same equipment.

The process of grinding ore fine enough for subsequent concentration is usually carried on in three steps, coarse crushing, intermediate crushing, and fine grinding.

Coarse Crushing Costs Are Small Part of Total

The cost of dumping and breaking mine-run rock to a size suitable for intermediate grinding is approximately 15 percent of the total grinding cost. Further to reduce the rock to a size suitable for fine grinding in a ball mill and in so doing produce 10 to 40 percent minus 100-mesh material costs about 33 percent of the total. To grind the balance of the rock so that nearly all of it is less than 100 mesh, entails over 50 percent of the total grinding expense. While these percentages will not fit each particular case, they are typical of grinding cost distribution.

There are in general use satisfactory machines for breaking mine-run ore to a size satisfactory for intermediate crushing. These machines all have large capacities and operate at low unit costs, but produce very little finished material.

The second step, intermediate grinding, continues with the reduction in size to not less than 8 or 10 mesh, and produces in so doing a substantial amount of finished material. For this purpose there are available several types of machines that have large capacities and operate at low unit costs.

The most common intermediate crushing machines are: rolls in closed circuit with wet screens, rolls in closed circuit with dry screens, rod mills, and short-head Symons crushers.

A 44-in. diameter by 16-in. face roll, operating in closed circuit with wet screens, handling 1,800 tons of original ore all minus 1¼ in. in size, reduces the total tonnage to minus 8 mesh and in so doing produces 500 tons of minus 100-mesh material per 24 hours, or at the rate of 278 tons of minus 100-mesh material per 1,000 tons of original feed. This roll and all auxiliaries used 9.7 kw-h and 0.44 lb. of steel per ton of minus 100-mesh material produced.

A 72-in. diameter by 20-in. face roll, operating in closed circuit with dry screens, handling 5,400 tons of ore crushed to minus 1¼ in., reduces all to minus 3 mesh and in so doing produced 1,160 tons of minus 100-mesh material per 24 hours, or at the rate of 215 tons per 1,000 tons of original feed. This machine and auxiliaries used 8 kw-h and 0.38 lb. of steel per ton of minus 100-mesh material produced.

A 9-ft. diameter by 12-ft. rod mill, operating in an open circuit, handling 3,000 tons of original ore crushed to minus 1 in., reduces all to minus 3 mesh and in so doing produced 642 tons of minus 100-mesh material per 24 hours, or at the rate of 214 tons per 1,000 tons of original ore. In doing this work the rod mill used 9.7 kw-h and 1.79 lb. of rods per ton of minus 100-mesh material produced.

A short-head Symons crusher, operating in an open circuit, with an initial feed of 3,000 tons of minus 4-in. material, reduces all to minus ½-in., and in so doing produces approximately 300 tons of minus 100-mesh material per 24 hours, or at the rate of 100 tons per 1,000 tons of original feed.

The foregoing examples of intermediate crushing practice are not given with the idea of comparing relative merits of the various machines, as they cover in each instance crushing accomplished on ores of different character. However, they do illustrate the dual purpose of the intermediate crushing circuit.

The Ball Mill Is Pre-eminent As Fine Crushing Medium

For the third and final step, or the reduction from possibly ⅓ in. diameter to a maximum amount of minus 100-mesh material, the ball mill has

no competitor. This machine is more limited as to capacity and is expensive to operate per unit of production.

Basically, ball mills are today much as originally built, but changes in the last 20 years in the type of linings, balls, feeding and discharging mechanisms, dimentional and speed characteristics, have all contributed to the lowering of grinding costs. All these features have been constantly improved, but until a revolutionary change is made in fine grinding principles or machines, the betterments, of necessity, must be only small refinements of those already practiced.

The influence that the tonnage of feed passed through a ball mill has on the mill's ability to produce finished material is illustrated by the following: An 8-ft. x 12-ft. ball mill with a feed of 1,400 tons of minus ¼-in. ore, plus circulating load of 3,600 tons per day, produces 531 tons of minus 100-mesh material per 24 hours, or at the rate of 1 ton of minus 100-mesh material for each 9.4 tons passing through the mill.

On increasing the circulating load by 2,000 tons an additional 10 tons of minus 100-mesh material was produced, or for each additional 200 tons of circulating load passed through the mill 1 ton was finished. When the combined load exceeded 7,000 tons there was a slight reduction in the amount of minus 100-mesh material produced per day. From this study and similar substantiating data it is evident that a ball mill must be fed at a constant and suitable rate, with sands that require grinding, in order to obtain the utmost capacity in finished material.

Variable Speed Motors Improve Classifier Performance

To improve the ball mill feeding practice at Utah Copper Company, the secondary classifier units are being equipped with variable-speed motors which allow the rake speed to be changed as desired. Heretofore, it has been impossible, with the simple water regulation, to maintain a narrow range of sand loads through the changes of soft and hard ores. By augmenting water control with rake speed, a maximum volume of water, which is important in selective classification, can be maintained. The rake-speed variation functions to control the desired degree of settling. By way of illustrating the improvement in the constancy of sand loads, it is estimated that with simple hydraulic variation, ball mill loads varied between 1,000 tons per 24 hours with soft ore, and 3,000 tons with hard ore, whereas, with the addition of rake-speed control, the limits are between 1,800 and 2,500 tons.

Mill scale tests indicate that the classifier overflow will contain 2 to 3 percent less of plus 100-mesh material with variable-speed rakes as compared to constant speed rakes. Flotation tests, with feed produced from both systems of classification, showed a definite trend to better copper metallurgy with the variable-speed rake classifier product because of lower tailing losses. As the sand load to the ball mill can be controlled at a lower maximum, it is possible to maintain higher production when handling hard ore than was possible with a constant-speed rake classifier feeding the mill.

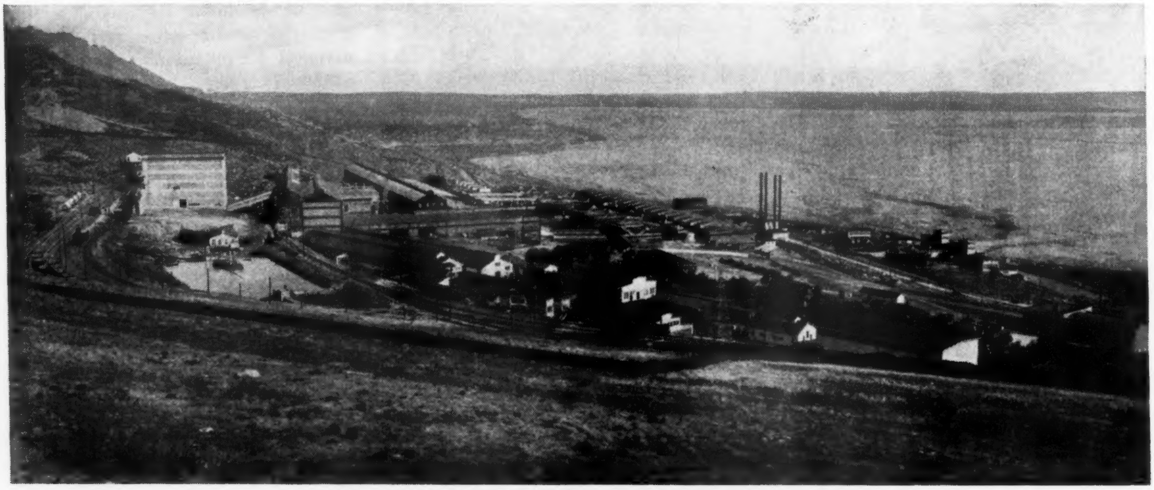
Alternating current variable-speed brush-shifting motors have been found suitable in this service. These offer a range in speed of almost 3 to 1. In practice, rake speeds from 8 to 20 strokes per minute have been found beneficial.

Variable Speed Control May Be Made Automatic

At the present time the variable-speed regulation is made manually and changes in sand load are made only during marked increases or decreases. This occasions a considerable delay in making corrective adjustments. If the variable-speed rakes could be automatically regulated to deliver a constant sand load, the ball mill would then perform at its maximum insofar as loading is a factor.

Many times full control of classification and consequently grinding operations are hindered by the requirements of a subsequent process, for example, the practice of treating classifier overflow direct by flotation. Thickening ahead of flotation excludes any such limitations and in addition serves advantageously in several other respects.

In order to increase selective classification and grinding, one operator has achieved better results by introducing the pulp into the raking compartment rather than into the bowl of the conventionally operated bowl-drag classifier. Depending upon the iron content and mineralogical characteristics of the ore, the copper concentrate grade was increased 0.6 to 1.67 percent.



Arthur concentrating plant of Utah Copper Co., Garfield, Utah

Ball Load of Graduated Sizes Increases Mill Efficiency

Although not a new subject, studies are being made of the correct graduation of balls for grinding a given ore. After the initial ball-size determination, it seems important to maintain a certain graduation of ball load. Since different size balls wear at different rates, the addition of graduated ball loads are being investigated at several plants.

A number of forged alloy steel balls have made their appearance on the market and although much more costly than the ordinary cast ball they have found a definite place in ball mill work. Due to a greater resistance to corrosion and abrasion, more uniformity of hardness and a somewhat higher grinding efficiency they have proven themselves economical in certain areas where transportation costs are high.

In the choice of ball mill liners the ultimate cost of the liners per ton of finished product and the effect the thickness of the liner itself will have on the capacity of the mill are always to be considered. This has brought about the use of alloy heat-treated steel ball mill liners.

One of the Canadian properties has indicated the value in reducing liner thickness and so increasing the ball mill capacity with lowered operating expenses. Another corporation has developed a heat-treated alloy liner containing manganese, chromium and molybdenum. After heat treating, the finished casting is tough and has a Brinell hardness of 450 or slightly better.

Steel Rails and Concrete Make Good Ball Mill Lining

A very cheap liner in cost per ton of finished material is made by dovetailing steel rails laid parallel to the shell of the ball mill and held in position with concrete. The ball and base of the rails wear rapidly and leave exposed longitudinal ridges of steel between which are pounded partially worn balls, so, in effect, the entire ball mill liner is composed of balls. Liners of this type will give service of approximately 1,000 days.

Synchronous Motors on Ball Mills Improve Power Factor

Because of high production levels today, plants that have been in operation for a number of years find their electrical equipment overloaded. The transformers and lines are especially taxed. As the ball mills require a large portion of the power used by the plant their motors afford a point for effective power factor correction. This correction has been obtained by the installation of high-starting torque synchronous motors driving ball mills. The power factor correction thus obtained makes it possible in many instances to continue high tonnages without increasing transformer and line capacities.

In the practice of fine grinding there are many innovations that may, as time goes on, become of considerable importance but this discussion has been limited to such known features as have proven gainful.

COARSE CONCENTRATION

By W. L. ZEIGLER
Mill Superintendent
Hecla Mining Company
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EARLY methods of dressing and beneficiation of ores depended largely on coarse concentration and hand sorting in relatively large sizes. The principle of recovering the mineral as soon as free was of utmost importance at that time on account of inadequate machinery and processes to recover the values in the slimes. This principle is still recognized as sound practice in many instances, even with the present day proficiency of fine grinding equipment and methods of extraction of minerals in extremely fine sizes.

Jigging Is Still An Important Method

The principal method of concentration of ore in sizes ranging from fine sands to 1½ in. was by jigging in Hartz jigs which had many variations and modifications. Between 1 and 1½ in., the jigs were usually used to eliminate waste rock and were seldom used to produce a finished product in the form of a concentrate. This was due not only to the character of the ore in this range of sizes, but also to the inefficiency of the jig to produce a clean concentrate; mainly responsible to the large pulsation motion necessary to keep the bed loose enough to prevent settling of the heavy particles.

Under 1 in. and down to 20 mesh, jigs were quite efficient for rejecting waste rock as tailings; thus producing concentrates as clean as the physical characteristics of the ore would permit and also separating particles of intermediate gravity as middlings.

In the lead, zinc fields of Missouri, Kansas and Oklahoma, sizing before jigging was not and is not now carried out in careful steps. Most of the old mills in the west went almost to the extremes in this respect on account of the more refractory nature of the ores and the lesser differential of specific gravity between the concentrates, middlings and tailings.

Sand tables were used principally for concentration between jig sizes and slimes. The buddle and vanner so commonly used in the past for treatment of slimes have practically disappeared.

Gravity Concentration In General Yielding to More Efficient Methods

When the froth flotation process was first developed, it was used in the place of vanners and did not for a long

time threaten the use of jigs. Gradually, however, the process was improved as well as grinding, classification, filtering and other appurtenances necessary, so gravity concentration has in most places, step by step, given way to the more efficient means of recovery.

Smelters in the past were designed and equipped to treat concentrates in relatively coarse sizes and large proportions of slimes usually received penalties. With the advent of flotation and the development of the flotation process, this situation was gradually rectified step by step. This had a definite reaction in not only prolonging the use of coarse concentration by jigs, but also retarded the use and perfection of the flotation process.

Diaphram jigs are a recent innovation and have come into use principally in the recovery of coarse gold. They are used extensively in ball mill grinding circuits as well as replacing riffles in dredging operations.

Hand sorting has not entirely disappeared. There are cases where a selection of products can be made by sight more effectively than by specific gravity separations or flotation.

Sink and Float Processes More Widely Used

In the last four or five years a new process of coarse concentration has come into use; mainly, for beneficiation of low grade ores. This is commonly called "Sink and Float" or "Differential Density."

This process is not altogether new, but has been used experimentally for many years. First, with the use of heavy liquids as a separating medium. At that time, on account of limited manufacture, the cost of the liquids were prohibitive for practical operations. They were also toxic and very volatile.

The sink and float process is truly a coarse concentration of ores or minerals. The material to be handled by this process is crushed by the conventional plants to a predetermined size for maximum or economic separation as the case may be. All fines, usually less than 3 millimeter, must be entirely eliminated from the feed as well as the surplus water. The fines flow directly to other concentration processes.

Latest developments in the separating medium for the process uses finely ground solids of heavy density in water suspension. There are several important features in the nature of the medium which must be considered. First, it must have low viscosity in order to permit the coarse particles to flow freely in the mass. Secondly, the heavy density solids which constitute the medium must be fine enough to sustain suspension in order to make a stable medium at a given density.

As the medium is circulated and comes into contact with the ore, it is certain to become contaminated with gangue slimes and fine particles which were broken from the ore by abrasion. Unless this foreign material is removed constantly, the medium will rise in viscosity and drop in specific gravity. The extent of this will vary according to the physical characteristics of the ore. Several methods have been developed to clean the medium which consist of tabling and flotation on sulphides or magnetic separation in the case of ferrosilicon.

The plants in operation today will treat successfully sizes up to 1½ in., clear screen opening, this being more or less the mechanical limits of the apparatus.

In the case of concentration by jigging, the separation of the minerals is judged by visible inspection of the products by the operator. In the sink-float process, if the density, viscosity and stability of the medium is kept at a predetermined point, the separation of the minerals will be automatic. The operation of this is quite simple and requires little technical knowledge on the part of the operator. In plant operation it is possible to maintain a specific gravity of the medium which will not vary more than 0.02 of a point. From this close control it is possible to obtain an extremely accurate separation of the minerals without a great amount of middlings as is the case in jigging.

Sink-Float Methods Can Operate Within Close Limits

To give an idea of the close limits under which a sink-float plant can be operated, the separation of magnesite and dolomitic limestone is possible. With a medium of a specific gravity of 2.80, all material will sink; while at a specific gravity of 3.00, all material will float. Operating with a specific gravity of 2.88, a very satisfactory elimination of $CaCO_3$ from the magnesite is possible.

To demonstrate further the delicate separation of waste from a complex zinc-lead-iron ore, the following tabulation shows results in actual plant operation with medium from 2.75 to 3.00 specific gravity in gradual steps. It will be noted that the mineral content of the float or waste, as well as the percentage rejection, rises gradually and uniformly with the rise in density. This same ore was

Concentrator of American Zinc, Lead & Smelting Co., at Mascot, Tenn., employing differential density process

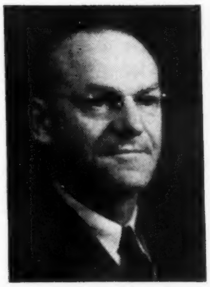
treated in a mill some years ago in which waste was eliminated by the use of Hartz jigs. The amount of rejection and the mineral content of the waste was in no way comparable to that produced by the sink-float process.

A distinct advantage of the sink-float process over other methods of coarse concentration is the low cost per ton daily capacity and the small amount of space required for the plant. The operating costs are comparable to other types of coarse concentration. In some cases the products from the sink-float process must necessarily be treated by other methods for further separation of minerals while in others, finished products can be produced.

Density	Elimination of float percent	Float assays percent		Sink plus fines assays percent		Recoveries in sink plus fines percent	
		Lead	Zinc	Lead	Zinc	Lead	Zinc
2.75	26.21	0.13	0.30	5.40	11.44	99.15	99.07
2.81	29.53	0.26	0.45	5.82	12.65	98.16	98.53
2.85	30.86	0.28	0.47	6.09	12.61	98.00	98.36
2.90	33.47	0.40	0.60	5.86	12.79	96.68	97.69
2.95	35.81	0.48	0.64	7.08	12.80	96.35	97.29
3.00	37.27	0.52	0.80	6.27	12.96	95.30	96.47

There is a distinct field for the further use of the sink-float process in ore dressing and the adoption of it will play an important part in metallurgy. This process will probably never cover the general use that has been achieved by froth flotation, but will undoubtedly be the greatest advance in ore dressing since the adoption of flotation.

FLOTATION



By A. W. FAHRENWALD
Dean, School of Mines
University of Idaho

THERE is hardly any mineral that cannot be floated (or depressed) by the skilled flotation technician. In practice, as many as four mineral products are being made from a single pulp feed, by successive flotation treatments. This is possible, owing to the pretty well understood scientific basis of the process and to the highly advanced state of the art. It must be stated, however, that flotation of a few minerals has escaped our best efforts.

It is of interest too to mention that the situation has been encountered, in the nonmetallic field in which a mineral from one ore body is readily floatable whereas the same mineral, mineralogically and chemically, from another ore body responds not at all to the process. I am thinking of the mineral magnesite, and point out that in the one case, that of successful flotation, the mineral had a highly crystalline structure, breaking with a granular fracture, while in the other, that of non-flotation, the mineral was dense, breaking in the concoidal form. The dense magnesite appeared to have formed from colloidal solution, and a surface, with respect to flotative property, simulating that of colloidal particles.

Flotation Reactions Are Largely Chemical

The reactions involved at mineral surfaces when chemicals are used to affect attachment between bubbles and mineral particles (or to prevent attachment as the case may be) are chemical, or at least for the most part so. Anyhow the chemical concept is the only useful one in applying the process.

Xanthate flotation, soap flotation, and cationic mineral flotation certainly are basically chemical. A few cases of "frother" flotation may not come in this category, but this type of flotation is, however, not of great importance. The question will not be further pursued here.

Mineral depression, in the cases of the use of cyanide, of lime, and of liquid glass, certainly is chemical. When the mechanism of the depression, in such cases as of the depression of lime and dolomite with tannic acid, is understood, it may also prove to be chemical.

Two systems of flotation are available, viz: (1) froth flotatation, and (2) oil agglomeration and tabling (not applicable to fines). Both processes employ essentially the same fundamental principle. Recently a fascinating new process embodying the oil agglomerating principle, but simulating the old "skin" flotation process, has been suggested (U. S. 2, 281, 066, Feb. 11). The patent refers particularly to concentration of a phosphate ore. The ore is agitated with an oil mixture to coat the phosphate constituent in the manner of preparing feed for the agglomeration-tabling process. The relatively dense commingled mass, in which the phosphate is floatable, is treated in a device in which the commingled mass is raised and lowered through the surface of a relatively thin body of flowing water to produce separation. The oiled phosphate particles float off on the traveling water surface.

New Spheres of Application Have Recently Been Found

There are many interesting new applications of the flotation process. Due to the limited space for the presentation of this paper, only three will be mentioned. One of these is the sulphide-rhodochrosite (pink manganese) flotation operation of the Anaconda Copper Mining Company at Anaconda, Mont. The operation is carried out in two stages; two froth concentrates are made, a "xanthate flotation" sulphide concentrate in the first stage, and a "soap flotation" concentrate in the second stage. The primary secret of the excellent success of this operation lies in the immunity of the carbonate to xanthate flotation.

A second, and the only strictly nonmetallic mineral flotation plant in the Northwest, is the magnesite flotation plant of the Northwest Magnesite Company at Chewelah, Wash. This is a 300-ton mill, taking crude, quarry magnesite feed containing lime, dolo-

mite, silicates, and magnesite. By a two-stage process, a high-grade magnesite concentrate is produced. The silica and silicates are frothed out and discarded in a first stage operation; lime and dolomite are depressed and magnesite floated in a second stage. This plant bristles with new and ultra-modern equipment, including electric ear and pulp density control apparatus in the grinding circuit, new type flotation machines, conditioners, reagent feeders, and sump sandpump. The plant is a level-site mill, containing under a single roof all equipment including ore bins and belt conveyors.

A third is cassiterite flotation at the concentrator of the Consolidated Mining and Smelting Company of Canada, at Trail, B. C. The ratio of concentration is over 2000:1.

Each of these operations, in its own right, is the only one of its kind on the continent. These examples serve to emphasize the continuing importance of the flotation process and its unlimited application in the mineral industry.

Many Problems Still Confront the Flotation Metallurgist

One of the harder flotation problems confronting the flotation metallurgist today is the dressing of sulphide-scheelite ores. There are many occurrences of scheelite in the Northwest in which one or more floatable sulphides are present. At a number of properties in British Columbia, scheelite occurs in substantial percentage with galena, sphalerite, and arsenopyrite. This represents an extremely difficult problem since the desired result is three clean concentrates, viz, galena, sphalerite, and scheelite. In addition, gold is present in important amount and is associated with both the galena and the arsenopyrite; the problem is tough. The factor which makes flotation recovery of the scheelite particularly difficult, although it has nothing directly to do with the floatability of the mineral, is the ease with which the mineral reduces to slime. In hard rock, and when fine-grinding is required to liberate the other minerals, lead, zinc, etc., sliming of the scheelite is inevitable. In this particular ore, the difficulty is multiplied by the presence of hard arsenopyrite. To discuss it further would require too much space.

This same type problem is encountered in dressing of the amazing new scheelite ore discovery in central Idaho. The sulphite mineral in this case is the strategic mineral, stibnite. The association of stibnite and scheelite is rather intimate, and fine-grinding will be required to affect desirable liberation. No doubt it will be licked. This problem, however, again brings up the question of mineral liberation in complex ores, fine-grinding, and the non-floatability of mineral particles in the low and sub-micron range. Little or no progress has been made in the solution of this problem.

Mechanical Improvements Have Been Made

In flotation machines, there have been several mechanical improvements, and there have been some worthwhile changes in the manner of routing pulp through the cells in series. Malozemoff and Ramsey (Eng. and Min. Jour., 142, 45-9, March, 1941) have discussed most interestingly the behavior and operating characteristics of flotation machines. Much of this kind of thing, however, is in the nature of speculation but nevertheless worthwhile. The ideal condition in a flotation cell is that of uniform, thorough aeration of the pulp with an absence of eddy currents and centrifugal action. Sanding and dead volume should, of course, be avoided. I shall, however, not get further into this very interesting question.

Relation between foam surface and volume in flotation cells is a question I have raised on a previous occasion (Eng. and Min. Jour., Feb., 1939). It has now been studied by Werner Grunder and Ernst Kadus (Metall. u. Erz., 37, 367-72, 1940), who conducted experiments in cells with the same foam surface but different volumes. The results showed that there is no important relation between surface and volume.

The capacity of high cells is greater than low cells, but the rate of flotation is nearly constant. Deep cells require proportionately more energy input, and this increased energy input may not give proportionately greater cell capacity. The perfect flotation cell has not yet made its appearance. Operators still discuss the relative merits of deep and shallow cells, large and small impellers, and cells that make their own air, and cells that require blowers. Some cells sand-up and others are fool-proof in this respect, but are criticizable in some other respects. On the whole, this is a healthy condition and makes for competition.

New flotation plant of the Northwest Magnesite Co., Chewelah, Wash.

Strategic Minerals Available in Latin America*

By J. S. McGRATH
Chief Economist
Foreign Minerals Division
Bureau of Mines

Latin America or, more properly, Mexico, Central and South America, have become a most vital part of the arsenal of democracy, in supplying in ever increasing amounts the strategic minerals which we ourselves lack for war-time production. Mr. McGrath, thoroughly familiar with the situation, gives us an over-all picture of developments of this program.

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THE war between the United States and the Axis Powers will have the effect of emphasizing the economic problems involved in the necessary shift from our peace time efforts to sell our products in Latin American markets to the war time necessity of purchasing essential strategic materials. During 1941 the United States Government and private industry literally combed Latin America to locate additional sources of strategic minerals. Intensive efforts were also made throughout the year by the Governments of most Latin American countries to stimulate production of strategic and critical minerals essential to our defense effort in areas already under development. Latin America has been a traditional source of supply for many mineral raw materials of which this country has an inadequate domestic supply and consequently has been obliged to import. During the present emergency, the United States will depend for a large percentage of its total imports of certain minerals on the other American Republics. Under existing conditions it is not deemed advisable to indicate the tonnages received during the past year of specific minerals available to this country from countries of Latin America, but there follows a list of the strategic and critical minerals produced in the several countries, the output of which will be available to the United States:

Argentina—Beryl, lead, mica, tungsten, zinc.

Bolivia—Antimony, copper, tin, tungsten.

Brazil—Bauxite, beryl, chromite, industrial diamonds, manganese, mica, nickel, quartz crystals, rutile, zircon.

Chile—Cadmium, copper, manganese, mercury, nitrates.

Colombia—Platinum.

Cuba—Chromite, copper, manganese, tungsten.

Guianas (British and Netherlands) —Bauxite.

Mexico—Antimony, bismuth, cadmium, copper, fluorspar, graphite, lead, manganese, mercury, mica, tungsten, zinc.

Peru—Antimony, bismuth, cadmium, copper, lead, tungsten, vanadium, zinc.

Purchases Were Made for Stockpile

Throughout 1940 and 1941, under Congressional enactment, Public, No. 117, 76th Congress, the United States Government purchased strategic mineral raw materials intended primarily for stockpile purposes. Owing to financial limitations and technical restrictions governing purchase operations, this Government's stockpile program was still largely in the paper stage by the summer of 1940. However, the program for procurement of strategic materials received an impetus in the form of Public, No. 664, of June 25, 1940, "An Act to authorize the purchase by the Reconstruction Finance Corporation of stock of Federal Home Loan Banks; to amend the Reconstruction Finance Corporation Act, as amended, and for other purposes." This Act authorized the Reconstruction Finance Corporation to form and finance corporations "for the purpose of producing, acquiring, and carrying strategic and critical materials as defined by the President." Public, No. 108, 77th Congress, approved June 10, 1941, further extended the powers of the Reconstruction Finance Corporation by authorizing it "to take such other action as the President and the Federal Loan Administrator may deem necessary to expedite the national defense program." Throughout 1941, by reason of its broad powers and vast financial resources, the Reconstruction Finance Corporation, through its subsidiaries operating under the Federal Loan Agency, was in a position to proceed with little or no hindrance to accumulate raw-material supplies required by industry for the defense effort.

Purchasing Program Was Broadened

In the initial stages of the defense program, efforts were made to purchase essential raw materials from the other American republics. The high standards of specifications established by the Army and Navy Munitions Board for stockpile purchases, the narrow range of commodities listed by the Board, and the comparatively small amount of money originally available for such purposes materially retarded the initial program as conceived by the proponents of the Strategic Materials Act which became law in June 1939.

The aforementionel Acts passed during 1941, extending the powers of the Federal Loan Agency and its subsidiaries, have overcome the objectionable features of the original authorization to purchase essential strategic materials. Agreements entered into between the Government of the United States and several Governments of Latin America during 1941 resulted

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in a material increase in the purchases of several urgently needed raw materials. Requirements for such materials, however, continued to increase during the year, and there was evidence that consumption estimates of practically all commodities originally had been placed at figures that were far too low. Consequently, plans were developed for the purchase of all strategic minerals available for export in the several countries of Latin America. During most of 1941, the agreements negotiated had an obvious preclusive element in the sense that such over-all agreements to purchase the entire output of a given country would naturally reduce the amount available to other countries. However, in the negotiations for the purchase of strategic materials, emphasis was placed on the definite requirements of the United States rather than on an effort to obstruct purchases by other countries.

Agreement Made with Brazil in 1941

The first over-all agreement to purchase all available minerals was negotiated with Brazil in May 1941. The Federal Loan Agency, through the Metals Reserve Company, agreed to purchase the entire exportable surplus of various Brazilian products for 2 years from the date of the agreement. The mineral products involved included bauxite, beryl ore, chromite, ferronickel, industrial diamonds, manganese, mica, quartz crystals, rutile and zircon. The list is not rigid, and it is anticipated that other commodities may be added as the occasion arises. The agreement embodies a prohibition against the exportation of the commodities specified, except to the United States or to other American republics having parallel systems of export control. However, the Metals Reserve Company is obligated to buy all the enumerated minerals not purchased by private industry in the United States or by other American republics. The mutual benefits to Brazilian producers and industrial consumers of the United States cannot be evaluated at this time, but there is evidence of an increase in the supply of strategic materials available to the United States and a more stable market assured Brazilian producers for 2 years, a fact that should have the effect of increasing output.

Purchasing Agreement with Mexico

An over-all agreement with Mexico became effective on July 15, 1941. The arrangement with Mexico followed the same general pattern as that with Brazil. The agreement with Mexico consists of two parts. The Mexican Government established an export embargo to all countries outside the Americas and to countries that have not established export controls similar to those of Mexico. Among the commodities affected are the following minerals: Antimony, arsenic, bismuth, cadmium, zinc, cobalt, copper, fluorspar, tin, graphite, manganese, mercury, mica, molybdenum, lead, tungsten, and vanadium. The Metals Reserve Company has agreed, during a period of 18 months from the date the joint agreement became effective, to purchase the exportable surplus of the commodities specified, provided the sellers after due effort are unable to dispose of their products through regular commercial channels. There are two notable differences between the Mexican and Brazilian agreements. The Mexican agreement is effective for 18 months, while the Brazilian agreement is for 2 years; in the Brazilian agreement, purchases will be made at fixed minimum prices while in the case of Mexico, the Metals Reserve Company has agreed in effect to pay current market prices for such materials as it may buy.

Peruvian and Bolivian Output Contracted

In October 1941 arrangements were concluded involving an over-all agreement with the Peruvian Government whereby certain strategic and critical materials were made available exclusively to the countries of the Western Hemisphere, with emphasis on the requirements of the United States. This agreement covers antimony, copper, lead, tungsten, vanadium, and zinc, the output of which the Metals Reserve Company will purchase for Government stockpile, it being understood that such purchases will be the surplus over and above purchases made by private industry in the United States.

In May 1941 the Metals Reserve Company entered into a contract with Bolivian producers, guaranteed by the Bolivian Government, to purchase the entire production of Bolivian tungsten for the next 3 years at $21 per short-ton unit. Late in 1940, the Metals Reserve Company contracted with tin ore producers of Bolivia for annual delivery to the United States during the following 5 years of tin concentrates equivalent to 18,000 tons of refined tin a year; the Bolivian Government guaranteed the performance of this contract.

Other contracts negotiated by the Metals Reserve Company with Bolivian producers provide for the procurement of the entire exportable surpluses of Bolivian antimony, lead, and zinc.

Other Purchasing Agreements Pending

At the close of 1941, negotiations were under way leading toward over-all purchasing agreements involving the mineral output of Argentina and Chile. It is anticipated that details concerning these negotiations will be forthcoming early in 1942.

When negotiations with other American republics now under way have been completed and those already concluded have the anticipated effect, it is apparent that the United States will have virtually the entire exportable surplus of strategic minerals produced throughout Latin America.

Latin American Mineral Survey

An arrangement has been worked out for a survey by U. S. representatives of mineral resources of Central and South American countries. A group of 40 engineers is expected soon to be assembled in Washington and assigned to specific countries and regions for mineral surveys.

These surveys have a double aim, one to determine the possibility of expanding the output of present mines in Latin America, and the other to discover new deposits of copper, lead, zinc, and other scarce ores.

Tin Use Restricted

At the beginning of the year, sweeping and rigid restrictions on the use of tin, except in cans and containers, were announced by the Director of Proirities.

Twenty-nine items for which tin cannot be used after March 31, 1942, were listed in Conservation Order M-43-a. Consumption of tin in the items specified between January 1 and March 31, 1942, is limited to 50 percent of the amount used in the corresponding period of 1940.

No restriction was placed upon the use of tin for cans and containers other than those then in force. A conservation order which was to be issued soon would limit the production and use of cans and containers.

All manufacturers using tin, except for containers and for the uses listed in the order, were limited in their consumption in any calendar quarter, starting January 1, to 50 percent of the amount used in the corresponding quarter of 1940.

It is expected that the new order will eliminate a potential demand for 15,000 tons of tin in 1942.

With the COAL DIVISION

of the AMERICAN MINING CONGRESS

SUPERVISION FOR MOBILE LOADING MACHINE OPERATIONS

• *A Preliminary Report of the Mechanical Loading Committee by S. M. Cassidy, Committee Chairman*

PROPER supervision is recognized as the primary essential for successful mechanized mining, but the function of mine officials in the operation of mobile mechanical loaders is not merely to "boss" the men to keep them working. The real problem of management is to co-ordinate a number of loading units, including their auxiliary phases of power, maintenance, lubrication, etc., so that all will operate together as integral parts of the whole.

The Committee on Mechanical Loading is making a report on the organization of supervisory staffs, to be based on a study of the experiences of companies using mobile loading machines. Due consideration will be given to the fact that different physical conditions and mining methods have necessitated the adoption of a number of different plans of supervision, and the committee therefore is not intending to recommend a "standard." However, it is self-evident that some ways are better than others and the purpose of this study is to determine which ways have been found the most satisfactory and what mistakes have been recognized and corrected.

The accompanying five charts have been submitted by the committee members as illustrating plans now in use, and to a large degree these follow the same general order. The superintendent is in charge of the entire mine and his authority is delegated through foremen, assistant foremen and section bosses; the size of his staff depending upon the arrangement of the workings, the amount of tonnage produced, number of shifts, etc. At first glance, these plans seem to be quite similar, but an examination will show that each one has certain individual characteristics, and the following brief explanation points out some of the differences.

Figure 1 represents the simplest type of organization, as all loading is on the day shift and the night foreman has to supervise only the face preparatory work and the material supply. In this plan the maintenance is under one head, and there appears to be no overlapping of authority between the maintenance and production departments.

Figure 2 is primarily a two-shift operation; the mine foreman is in personal charge of the day shift and also has the responsibility of directing the night foreman. Each section foreman has charge of the work in his territory up to the main haulage, and beyond this point the other underground operations are under the mine foreman. The maintenance head

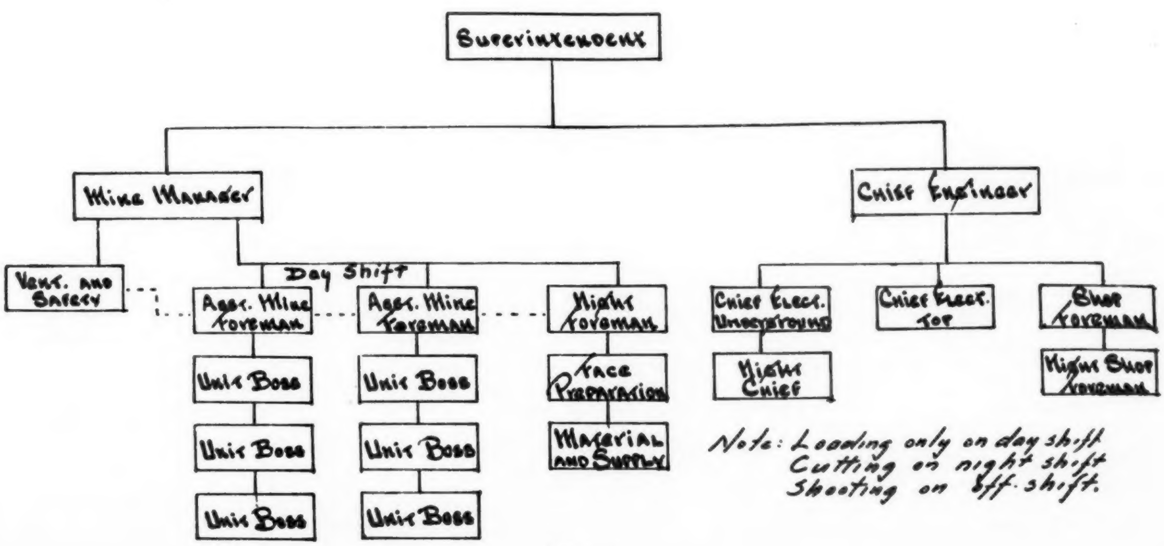


Figure 1

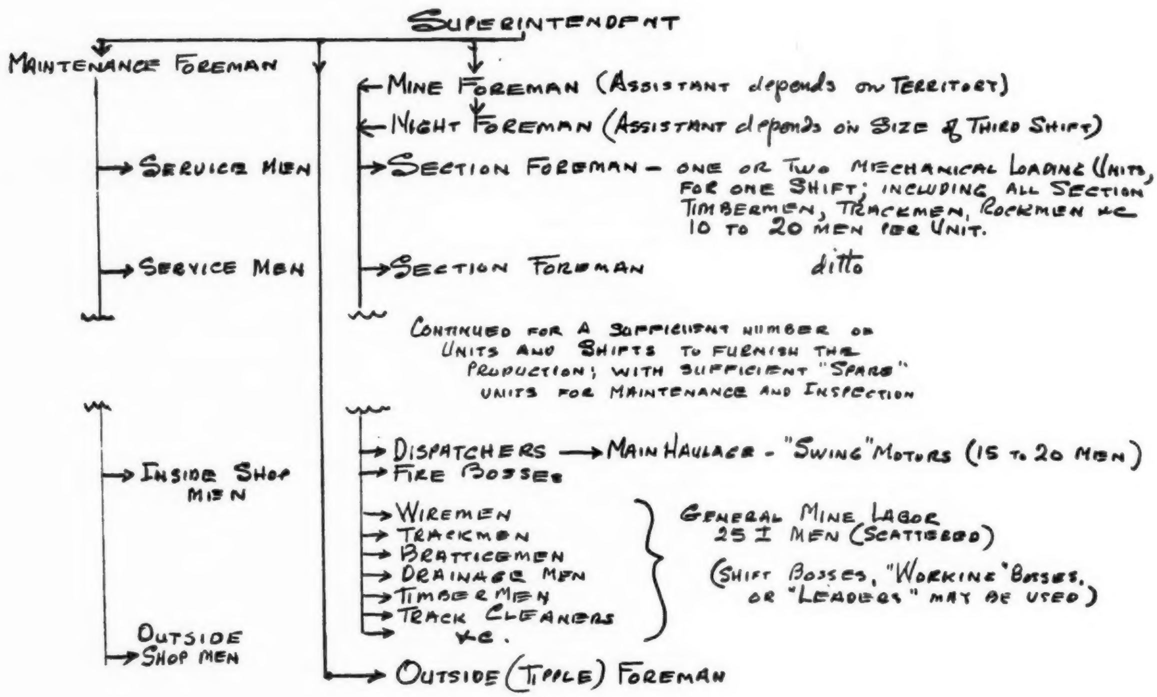


Figure 2

reports to the superintendent and there is no dual responsibility between the operating and maintenance departments for keeping the equipment in running order.

Figure 3 is a three-shift operation, where the mine foreman, the assistants and the maintenance foremen and the general crews are permanently assigned to the designated shifts. The section crews, maintenance and haulage men rotate each two weeks, which has had a tendency to prevent each shift from feeling that they have no responsibilities other than their own. This set-up gives the general mine foreman an opportunity to cover the entire operation, since he has an assistant to handle the detail work on the day shift. The foremen on the two night shifts assume the same responsibilities as the mine foreman, but are subject to his authority. The maintenance foreman reports directly to the mine superintendent, and his assistants and crews are under his direct charge.

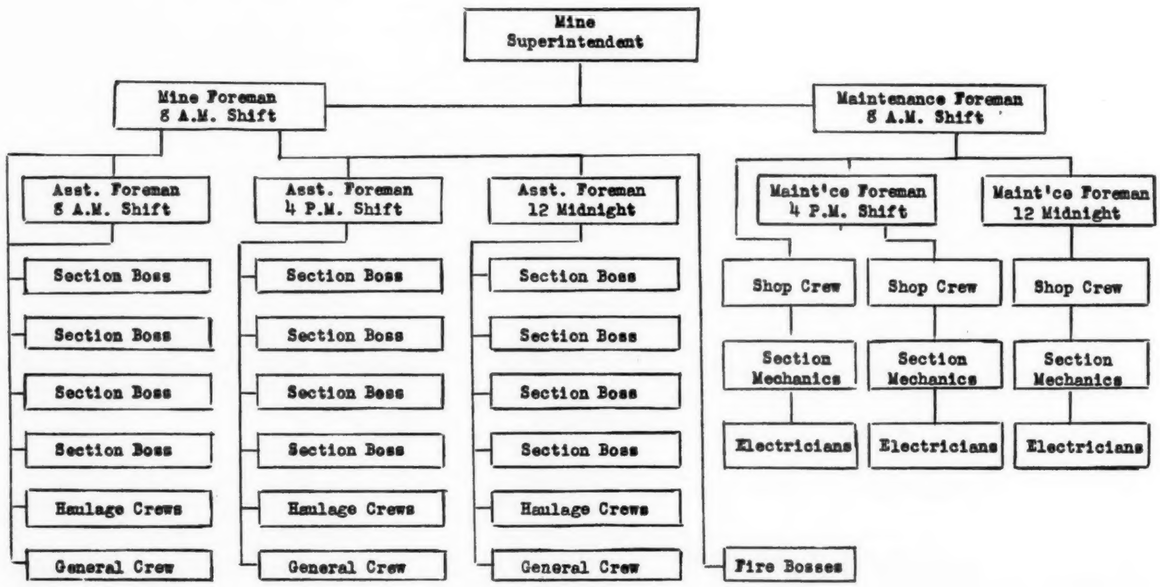


Figure 3

Figure 4 shows the mechanical and electrical repairmen under the direction of the master mechanic, but the chart seems to indicate that these maintenance men also receive orders from the mine foreman through the unit foreman. No comment was submitted with this chart to indicate definitely that such dual authority exists and, if so, what the result has been.

Figure 5 shows each shift divided into two parts, with two assistant foremen under the shift foreman. Also subject to his direct supervision, there is a dispatcher, fall crews each with a leader, and a general crew consisting of main line trackmen, timbermen, etc.

This organization proved troublesome; the day mine foreman had entirely too many bosses and men to direct and follow up, and on top of this he had the almost impossible job of trying to coordinate the work on three shifts. With this organization there was considerable tendency for each foreman to try to outdo the others in tonnage, regardless of how he left the preparation for the ensuing shift; as a result each section became imbued with the idea that it had to look out for itself only and there was much "buck passing."

The maintenance set-up worked out much better, principally because the maintenance foreman on the first shift exercised practically supreme control of all three shifts. He did not allow himself to be tied down so much with detailed work on his own particular turn that he would be unable to follow-through the work of the other crews.

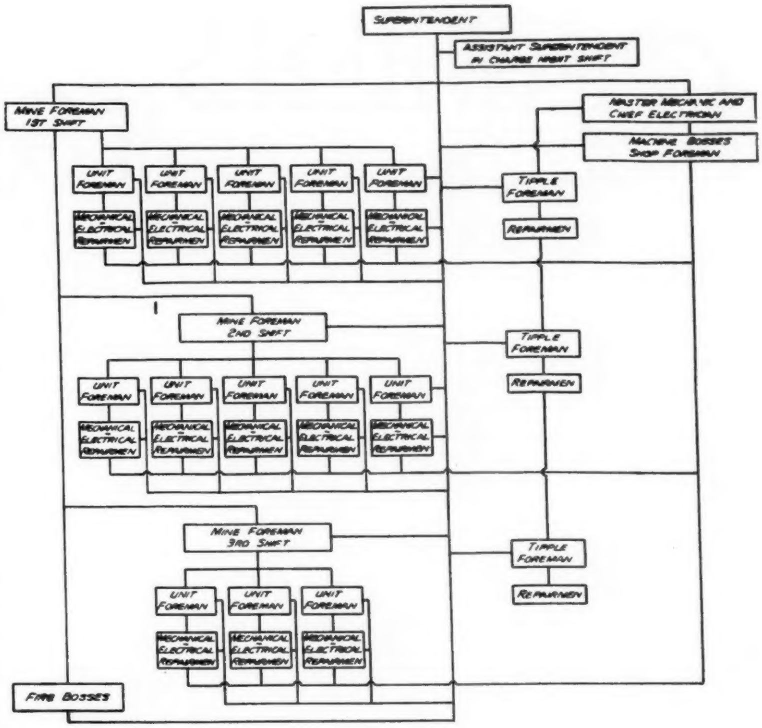


Figure 4

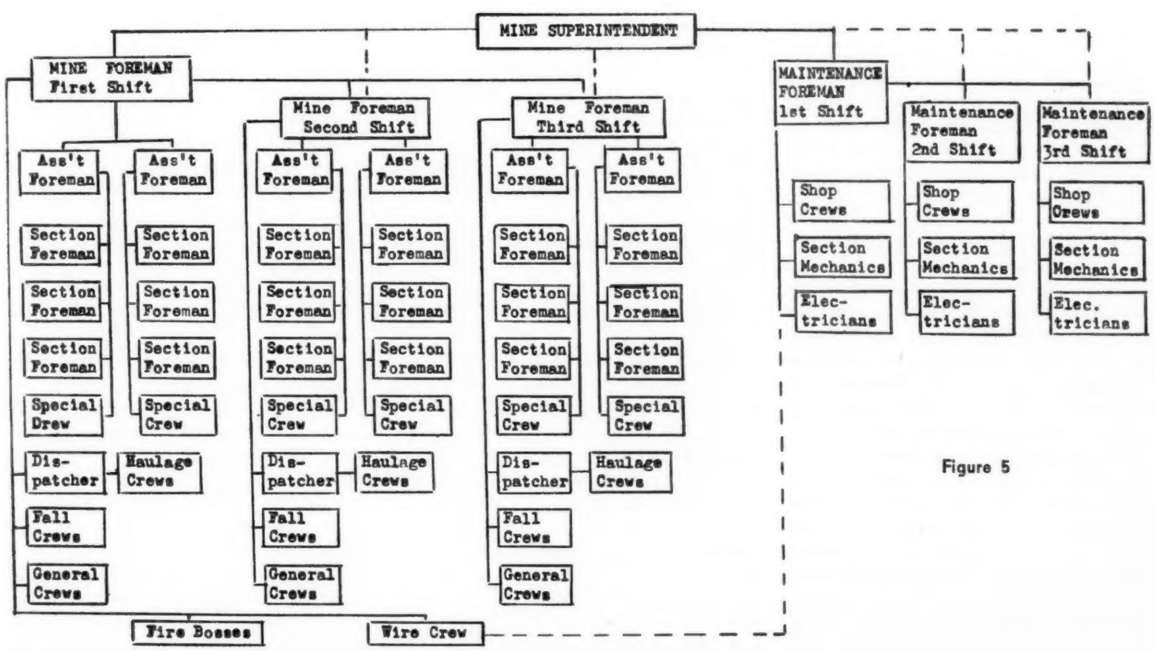


Figure 5

WHEELS of Government

• *As Viewed by A. W. Dickinson of the American Mining Congress*

Washington Highlights

WPB: Donald Nelson heads War Production Board; SPAB and OPM absorbed.

APPROPRIATIONS: Congress appropriates additional billions for prosecution of war.

TAXES: Conferences continue on means of raising more billions of revenue.

DEPLETION: Percentage and discovery methods under Treasury fire.

PRIORITIES: Wilbur Nelson continues as head of mining priorities; allocations coming.

SCRAP: Mines asked to turn in all available scrap.

METAL PRICES: Metals Reserve to pay premiums for new and high cost production; lead ceiling increased to 6.50 cents.

CHROME AND MANGANESE: Shipment requirements made easier.

PRICE CONTROL: Glass-Steagall Bill signed by President.

DUTY REDUCTION: Trade agreement with Peru threatens tungsten duties.

SOLID FUELS: Directors appointed to serve under Coordinator.

BECOMING more crowded day by day, wartime Washington is particularly marked by many hundreds of uniformed officers and men, and the grim faces of legislators and administrative personnel determined above all else to produce the most and the best of everything that is needed to win this war. The air is full of the spirit of a determined and united nation and of the spirit that, come what may, the United States of America and the United Nations must and will triumph. The hum of war activities is more to be felt than heard, but there is no hysteria or rushing around, and everyone is in deadly earnest. Thousands of able men are taking on heavy responsibilities with the full knowledge that they will be held strictly accountable for results.

The work of the new session of the House and Senate has thus far been confined almost entirely to appropriation bills and war measures desired by the administration. This situation is expected to continue, as there is every intention on the part of Senators and Congressmen to carry out the wishes of the wartime President. The only known possible exception to this is in the case of the St. Lawrence Waterway and Power Project which some Administration elements would like to put into effect, but which is thought by a great many members of the House and Senate to be wholly unnecessary and a needless handicap to the prosecution of the war.

Taxing Agencies Confer

The President's request for an additional $7 billions of tax revenues plus an increase of $2 billions in the social security taxes is resulting in numerous conferences between the Treasury, the staff of the Joint Committee on Internal Revenue Taxation, and congressional leaders, including members of the Ways and Means and Finance Committees. Chiefly sought by these conferences are agreed recommendations on the methods of procuring these enormous additional revenues. Main discussions apparently center around withholding taxes which would largely be a form of "check-off," and some form of sales taxes, as well as lowered exemptions and higher rates on income and excess profits levies.

References in the President's budget message and also during his press conferences to deductions and to depletion have resulted in reports that the Treasury will endeavor to confine depletion deductions to a cost basis. This would mean the elimination of the percentage method as well as the discovery method which is still available to the producers of non-metallics. Thus far the most direct statement of the Treasury attitude on this subject was made by Secretary Morgenthau in a speech at Cleveland on the night of January 24. The importance of this subject to mining companies warrants the following quotation:

"The final loophole which I shall mention this afternoon is one against which the Treasury has struggled for years without avail. If you use a machine in your business and that machine can be expected to last for 10 years, you are permitted to deduct each year for 10 years one-tenth of the cost of that machine. Because you will probably have to buy a new machine at the end of 10 years, this deduction is a fair and reasonable method of allowing you to recover your capital. Needless to say, you are not permitted to deduct more than the cost of the machine.

"But you may be surprised to learn that this is not true of mines and oil wells whose owners are permitted over the years to deduct far more than the amount of money which they have put into the property for the conduct of their business. The so-called percentage depletion provision of the income-tax law allows these companies not simply to deduct a percentage of the cost of their wells and mines each year until the entire cost has been made good, but to deduct an arbitrary percentage of their income indefinitely. An oil company which may long ago have recovered tax free many times the cost of the wells which it is operating is still permitted a deduction of 27½ percent of the gross income from those very same wells."

Recently the Congress, by enacting an amendment to the emergency defense facility amortization law, striking section 124 (i), removed a

troublesome feature of that law. This section denied special amortization deduction for a contract making provision directly or indirectly for reimbursement of the cost of defense or war facilities, unless a "Certificate of Government Protection" was issued.

Exit OPM

Mid-January witnessed the end of the OPM and the SPAB organization, when the President appointed Donald M. Nelson Chairman of the new War Production Board with powers even exceeding those of Bernard Baruch and the War Industries Board of 1917-18. Members of Donald Nelson's new board are Vice President Wallace, Lieutenant General Knudsen of the U. S. Army, Sidney Hillman, Secretary of War Stimson, Secretary of Navy Knox, Secretary of Commerce Jones, Harry L. Hopkins, and Price Administrator Leon Henderson.

Under the new board is a Requirements Committee and a Materials Division in charge of William L. Batt, a Production Division under William H. Harrison, a Division of Industry Operations under James S. Knowlson, a Purchases Division under Douglas MacKeachie, a Labor Division under Sidney Hillman, a Civilian Supply Division under Leon Henderson, Statistical Division under Stacey May, an Information Division under Robert Horton, as well as a Planning Division still to be organized.

Of special interest to mining is the fact that Dr. Wilbur A. Nelson will continue as administrator of mining priorities. While coal, metals and non-metallic producers have thus far been quite successful in securing needed machinery, replacement parts and current supplies, the mining machinery manufacturers are now experiencing difficulty in filling their requirements of steel plate and other scarce materials. Around the first of February a series of conferences with high War Production Board officials indicated early changes in procedure, which will result in the manufacturers receiving their materials through allocation orders. The situation is a difficult and critical one but the attitude and the intent of the War Production Board officials is constructive and it is believed that the solution will be quick and positive.

Early in January the Salvage Division of the board issued a call to the mining industry to collect and ship all metals, rubber and burlap scrap through the usual channels. Scrap material is very badly needed by the steel furnaces, foundries and secondary metal handlers, and the success of our war effort is seriously dependent upon its immediate and continuing procurement. All mining companies and mining men are urged to do their utmost to comply with this request, and they are further urged to make the necessary decisions to scrap idle and standing equipment NOW on the thought that if it is not in use now it probably never will be.

Increase Metal Production

Pressure from the war emergency agencies for increased production of copper, lead and zinc has in recent weeks brought advice from the producers to the federal agencies to the effect that only through increases in the metal prices can the country secure the additional production desired. At an informal hearing on lead prices January 5, conducted by Representative Compton I. White, of Idaho, western producers presented their views to a number of Congressmen and to Price Administrator Leon Henderson. The western producers stated that the price of lead should be increased to 8 or 9 cents in order to bring out marginal production, to encourage resumption of operation of idle mines, to stimulate exploration and development of additional ore bodies, and to encourage further metallurgical accomplishments in the treatment of low-grade deposits.

Closely following this hearing came the announcement by the OPA and OPM of payments by the Metals Reserve Company of premium prices of 17 cents per pound for copper, 11 cents for zinc, and 9¼ cents for lead, for "over-quota" production, for a period of two and one-half years beginning February 1, 1942. Also announced was an increase in the price of lead from 5.85 to 6.50 cents per pound New York, as a ceiling price. The ceiling price for copper remained at 12 cents and for zinc at 8¼ cents. Quotas to producing companies are in general to be based on the average monthly output for 1941 and premium payments for excess production are to be made monthly. The regulations covering the administration of this price order are now being written in the War Production Board and the Metals Reserve Company offices, and their issuance is expected in the very near future. War Production Board officials have expressed the hope that this premium price plan will result in an increase of 30 percent in the production of the affected metals; producers are not so optimistic although they will surely continue their efforts in 1942 as in 1941 to produce every possible pound of metal.

A constructive step was taken by the Metals Reserve Company as of the first of the year when a scale of purchase prices and grades was made public for chrome and manganese ores. A former minimum shipment requirement of 250 tons was reduced to a single carload lot, and freight paid from the rail point nearest to the mine will be refunded to the seller by the purchaser. It is anticipated that similar treatment may be accorded in the near future for other needed ores.

Legalized Price Control

Completion of the enactment of the Glass-Steagall Price Control Bill came with its approval by the President on the night of January 30. The measure gives the Price Administrator wide price-fixing powers, with authority to license business enterprises as a means of price enforcement. He may also issue priorities and purchase, sell, store or otherwise deal in commodities, and may, in order to obtain "the maximum necessary production" of any commodity, make purchases from marginal or high-cost producers or others. Purchase and sale of strategic and critical materials is reserved to corporations such as the Metals Reserve Company, and the law specifically provides that existing tariff duties shall not be modified or suspended in connection with any such purchases or sales.

Americas Waive Duties?

In connection with Canadian and Latin-American negotiations announcements have been made of plans to waive the payments of commodity duties between these countries and the United States for the duration of the war. It is generally conceded that such an action will require legislation but as yet no form of bill has been introduced by administration sources.

Also now pending is the proposed foreign trade agreement with Peru, in which tungsten ore and concentrates have been listed as commodities subject to negotiation for a reduction in duty of as much as 50 percent. January 24 was the closing date for the filing of briefs with the Committee for Reciprocity Information by interested persons, and on February 2 and 3 tungsten producers and a large number of Senators and Congressmen presented their objections at the oral hearing.

(*Continued on page* 93)

1942 Coal Show Program Revised

• *National Program Committee Gears Program to Special Problems of Wartime Production*

AN extraordinary meeting of the National Program Committee for the 1942 Annual Coal Convention was held at the William Penn Hotel, Pittsburgh, on January 16, which was attended by 17 operators, representing bituminous, anthracite and coal stripping. The purpose of this meeting was to revise the program as originally arranged by the committee early in November, so that the convention papers and discussions might be of maximum value in the new and critical problems facing the industry.

In calling the meeting to order, J. Noble Snider, National Chairman, stressed the fact that in the coming year the coal industry will be called upon for the greatest tonnage in its history, and that while efficiency must not be forgotten, methods to increase production must take precedence. He stated that he and other committee members had been reviewing the convention plans with special care since the United States had been attacked by the Axis; and that, although there might have been some question at the outset, he was now convinced that the Convention and Exposition this year were more important and more needed than ever before. He pointed out the support which the meeting was receiving from government officials, and spoke of the valuable aid it could render to the country in the war program. He emphasized the special value this year of the exhibits of machines and operating units, which afford opportunities to demonstrate maintenance methods and means of securing capacity production, to the hundreds of coal men in attendance. He expressed the opinion that the convention program should be redesigned to cover special wartime problems of management and operation and should have papers on subjects of interest to the executives and operating men alike.

The viewpoint thus expressed was shared by committee members present, who felt that a concerted effort of both operators and manufacturers is needed to put coal mining on a wartime basis. The attendance at the committee meeting, with its wide representation from the major coal mining fields, was definite proof that the 1942 Convention and Exposition is recognized as the most effective means of bringing all units of the industry together for discussing methods and coordinating plans.

In selecting specific subjects for the program, the committee gave careful consideration to a number of questions. The problem of raising the capacity of existing machines and securing additional equipment for still greater production is of course basic, but the corollary operations of maintenance, power, preparation, ventilation, management and personnel training must all be taken into account if tonnage is to be increased. In addition, the war has raised important new problems of Priorities, Distribution, Scrap Salvage, and Sabotage Prevention, which must be solved in cooperation with agencies of the U. S. Government.

The committee, after reviewing this whole situation, selected subjects which it considered to be of widest interest and application. The topics to be discussed in the general sessions and those devoted to the problems of deep mining are shown here. In addition, as announced in the January Mining Congress Journal, there will be two special sessions on strip mining, in a separate meeting room.

The committee emphasized the industry's rapidly growing dependency on mechanical aids to production, and pointed out that through the Coal Show the manufacturers can render a real service by showing exactly how their products—both those now for sale and those already in the mines—can contribute most to the job at hand. It was especially suggested that exhibits this year might stress the "insides" of machines, by showing dismantled units, sectional assemblies, etc. Such displays can show the critical materials required, the possible use of substitute materials, and will be of special help to operating men in their maintenance and repair problems.

Space reservations to date promise that the Exposition will be equal or superior to those of previous years. Special arrangements have been made for an OPM display and other governmental exhibits, tying the coal industry's efforts to the war program.

PROGRAM SUBJECTS

Maximum Production from Mechanical Loading

Track-Mounted Loaders and mine cars

Tractor Loaders and shuttle cars

Conveyor Mechanical Loading

Belt Conveyors and multiple units

General Operations

Ventilation — Sealing mined areas, improved ventilation methods

Roof Support—Effect on production, causes and prevention of falls

Face Operations—Cutting, drilling, blasting

Equipment Maintenance

Maintenance Methods — Rebuilding machinery, substitute materials

Conservation of Materials—Centralization of supplies, salvage recovery

Coal Preparation

Wartime Coal Preparation—Maintaining quality standards, reducing number of screen sizes

Coal Drying Methods and other auxiliaries of preparation

Safety

Explosives—Handling and distributing underground

Dust Allaying in cutting, loading and transporting

Management and Personnel

Wartime Personnel Problems—Absenteeism, replacements, "slacking," transferring

National Wartime Problems

Priorities on Mining Equipment—Dr. Wilbur A. Nelson, *Administrator of Mine Priorities, OPM*

Salvage of Scrap Metals—George T. Weymouth, *Chief, Industrial Salvage Section, OPM*

Coal Distribution and Production—T. J. Thomas, *Associate Director for Bituminous Coal, Office of the Solid Fuels Coordinator* (tentative)

Prevention of Espionage and Sabotage — Inspector E. P. Coffey, *Chief, Technical Laboratory, Federal Bureau of Investigation*

19th Annual Coal Convention and Exposition

PARTIAL LIST OF EXHIBITORS

Allis-Chalmers Mfg. Co.
American Brattice Cloth Corp.
American Bridge Co.
American Car & Foundry Co.
American Cable Division
American Chain & Cable Co., Inc.
American Cyanamid & Chemical Corp.
American Steel & Wire Co.
Atlas Powder Co.
Barber-Greene Co.
Bethlehem Steel Co., Inc.
Bixby-Zimmer Engineering Co.
Bowdil Company
Brown-Fayro Co.
Bucyrus-Erie Co.
Cardox Corporation
Carnegie-Illinois Steel Corp.
Centrifugal & Mechanical Industries, Inc.
Chicago Pneumatic Tool Co.
Cincinnati Mine Machinery Co.
Cities Service Oil Co.
Coal Age
Deister Concentrator Co.
Deister Machine Co.
Differential Steel Car Co.
Duff-Norton Mfg. Co.
du Pont de Nemours & Co., E. I.
Edison, Inc., Thomas A.
Electric Railway Equipment Co.
Electric Railway Improvement Co.
Electric Storage Battery Co.
Flood City Brass & Electric Co.
Gibraltar Equipment & Mfg. Co.
Goodman Manufacturing Co.
Gorman-Rupp Co.
Gulf Oil Corp.
Guyan Machinery Co.
Hazard Wire Rope Division
American Chain & Cable Co., Inc.
Hendrick Mfg. Co.
Hercules Powder Co., Inc.
Hockensmith Wheel & Mine Car Co.
Hulburt Oil & Grease Co.
Imperial Bronze Mfg. Co.
I-T-E Circuit Breaker Co.
Jeffrey Manufacturing Co.
Johnson-March Corp.
Joy Manufacturing Co.
Kensington Steel Co.
King Powder Co., Inc.
Koppers Co.
La-Del Conveyor & Mfg. Co.
Leschen & Sons Rope Co., A.
Link-Belt Co.
Ludlow-Saylor Wire Co.
McNally-Pittsburg Mfg. Corp.
Mack Trucks, Inc.
Macwhyte Company
Mancha Storage Battery Locomotive Co.
Marion Steam Shovel Co.
Mechanization, Inc.
Mine Safety Appliances Co.
Mines Equipment Co.
Mining Congress Journal
Mining Machine Parts, Inc.
Myers-Whaley Co.
National Electric Coil Co.
National Malleable & Steel Castings Co.
National Tube Co.
Ohio Brass Co.
Ohio Carbon Co.
Osmose Wood Preserving Co. of America, Inc.
Owens-Corning Fiberglas Corp.
Penn Machine Co.
Pennsylvania Electric Coil Corp.
Philco Corp., Storage Battery Division
Pomona Pump Co.
Portable Lamp & Equipment Co.
Post Glover Electric Co.
Princeton Foundry & Supply Co.
Productive Equipment Co.
Prox Co., Inc., Frank
Pure Oil Co.
Roberts & Schaefer Co.
Robins Conveying Belt Co.
Roebling's Sons Co., John A.
Rome Cable Corp.
Sanford-Day Iron Works, Inc.
Scully Steel Products Co.
Simplex Wire & Cable Co.
Simplicity Engineering Co.
Socony-Vacuum Oil Co., Inc.
Standard Oil Co. (Indiana)
Sullivan Machinery Co.
Talcott, Inc., W. O. & M. W.
Tamping Bag Co.
Templeton, Kenly & Co.
Tennessee Coal, Iron & Railroad Co.
Tool Steel Gear & Pinion Co.
Tyler Co., The W. S.
Union Wire Rope Corp.
United Engineers & Constructors, Inc.
U. S. Steel Corp. Subsidiaries
Watt Car & Wheel Co.
Weir Kilby Corp.
Western Cartridge Co.
Westinghouse Air Brake Co., Industrial Division
Westinghouse Elec. & Mfg. Co.
West Virginia Rail Co.
Wickwire-Spencer Steel Co.
Wood Preserving Corp.

Sulphur

(Continued from page 57)

ing amounts of high-grade pulp for the increased rayon production. The industry is now faced with a new demand. While in the past the volume of cotton linters has been sufficient for nitro-cotton manufacture for military explosives, it is estimated that an additional 500,000 tons of pulp will now be required for the manufacture of explosives and for lease-lend material.

Sulphur Is Being Substituted For Other, More Scarce, Materials

In many instances in the present emergency where substitute materials have been called upon it has been found that tht substitutes themselves have become scarce almost at once. This has been true, for instance, in the plastics industry where plastics have been substituted for light metals wherever possible. Sulphur and sulphuric acid are serving well and receiving little notice in this problem of substitutions. One example, however, is worthy of note. Chlorine produced as a byproduct of sodium manufacture has been converted to hydrochloric acid for the production of tetraethyl lead. More than 10,000 tons of chlorine have been made available by producing the hydrochloric acid from salt and sulphuric acid releasing the chlorine for defense work where chlorine alone will serve. A number of similar readjustments are being studied, and several processes for the direct production of chlorine from salt and sulphur trioxide with sodium sulphate as a by-product have been proposed. A number of the proposals for aluminum production from clay involve the solution of the aluminum-bearing mineral in sulphuric acid.

Perhaps the outstanding characteristic of the present worldwide war is that it is so largely a trial of industrial strength. As far as sulphur is concerned, the nation is in an enviable position. In spite of the greatly increased demands which will be made upon it, the American sulphur industry will be able to supply needed sulphur in abuandance both in the United States and to the united nations in other parts of the world.

Loading sulphur from a vat into gondola cars, Hoskins Mound, Texas

PERSONALS

George F. Campbell was elected president of the Illinois Coal Operators Association at the annual meeting held in Chicago in December. Other officers elected were **Fred S. Wilkey**, secretary; **Thurlow G. Essington**, general counsel, and **C. W. Peterson**, treasurer.

Jorge R. Sendon, formerly in the geological department of the Anaconda Copper Mining Company at Butte, was granted this winter a curatorial assistanceship at Princeton University, Princeton, N. J.

James F. Frost has been made manager for the Lehigh Metals Co. at Mogollon, N. Mex.

John P. Skinner, formerly mine engineer for the London Mines & Milling Co. at Alma, Colo., has joined the staff of the Climax Molybdenum Company at Climax, Colo.

William B. Rhodes recently left for Caracas, Venezuela, where he is to be consulting metallurgist and mill superintendent for the New Goldfields of Venezuela Ltd.

E. L. DeGolyer, consulting petroleum engineer of Dallas, Tex., and deputy for conservation under the Federal Petroleum Coordinator for National Defense, was awarded the John Fritz Medal for 1942 by the American Institute of Mining and Metallurgical Engineers. The medal is generally recognized as the greatest distinction in the gift of the engineering profession, and was made to Dr. DeGolyer in recognition of his pioneer work in the application of geophysical exploration to the search for oil.

C. H. Dodge, formerly safety engineer for the Buckeye Coal Company at Nemacolin, Pa., has been appointed one of the senior coal mine inspectors for the U. S. Bureau of Mines and will be stationed at the Mt. Hope, W. Va., headquarters. Mr. Dodge has been at Nemacolin for the past 12 years, and, before leaving, he was presented with a watch by officials and employes of the company in recognition of his valuable services.

Harry W. Leet, formerly salesman in the Toledo territory for the Carter Coal Company, has been appointed district manager of a new sales district recently created by the company and will headquarter in Toledo.

Howard I. Young, president of the American Zinc, Lead and Smelting Co., and president of the American Mining Congress, was recently elected a director of the Baltimore and Ohio Railroad, succeeding **Carl A. de Gersdorf**, who has resigned.

Walter C. Page, formerly general manager of Trepka Mines in Yugoslavia, has returned to the United States and is now with the Copper-Zinc Branch of the Materials Division of the OPM, engaged in work relating to zinc production. Mr. Page returned to the United States last year on one of the last steamers of the American Export Lines to leave Lisbon.

Robert Dalton has been employed by the Freeport Sulphur Company for work in Santiago, Cuba. He was formerly assayer for the Nevada-Massachusetts Company near Golconda, Nev.

H. T. Hamilton of the Metals Reserve Company was recently elected treasurer of the A. I. M. E., succeeding the late Karl Eilers, but has found it necessary to resign from his office as his work in Washington will require his full time.

Elmer W. Pehrson, chief of the economic and statistics branch of the U. S. Bureau of Mines; **Donald F. Hewett**, geologist in charge of the metalliferous section of the U. S. Geological Survey, and **Charles Will Wright**, foreign minerals specialist of the U. S. Bureau of Mines and now connected with the Office of the Coordinator of Inter-American Affairs, recently left the United States for Santiago, Chile, where they were to be official American delegates to the first Pan American Congress of Mining and Geology to be held in that city on January 15. Enroute to the conference the delegates were to stop at Lima, Peru, and La Paz, Bolivia, and on the return they were to visit Buenos Aires and Rio de Janeiro to discuss problems of mutual interest with mining departments of the respective South American nations. The Santiago meeting was sponsored by the Chilean Institute of Mining Engineers and by the Chilean Government, with a view to promoting a permanent interchange of ideas among mining engineers and geologists of the Americas.

Harry W. Marsh, formerly superintendent on flood control work for the War Department in the Coeur d'Alene district of Idaho, has been named secretary of the Idaho Mining Association, Wallace, Idaho, succeeding James W. Gwinn, who died recently. As superintendent of flood control projects, Mr. Marsh has directed to completion a number of major improvement projects in the Coeur d'Alene district since 1935.

Ernest W. Ellis, who has been manager of the Coco Mines, Ltd., near San Carlos, Rio Coco, via Puerto Cabezas, Nicaragua, has returned to the United States.

Noel S. Christensen has been made superintendent of the Hidden Treasure mine in Dry Canyon near Ophir, Utah. He was formerly assistant superintendent of the United States Mine at Bingham Canyon, Utah; he succeeds **E. F. Kincaid**, who has been transferred to the United States mine as superintendent, replacing **Frank Hoine**, retired.

J. A. Hunt of Beckley, W. Va., was elected vice president in charge of operations of the New River Co. at the last annual meeting of the board of directors.

T. J. Harris has been made district sales manager of the Ohio Brass Company in Kentucky, Tennessee and Virginia, the territory formerly managed by the late Ward Brannon. Headquarters will be at Middlesboro, Ky. Before being associated with the Ohio Brass Company, Mr. Harris was connected with the Fork Ridge Coal and Coke Company.

Arman F. Frederickson is engaged in research work at the Montana School of Mines at Butte, conducting research on the determination of the solubilities of the heavy-metal xanthates and sulphides by spectroscopic methods, and their relationship to the flotation theory. Before going with the School of Mines, Mr. Frederickson was chief geologist for Cornucopia Gold Mines, Inc., at Cornucopia, Ore.

Dean Rollans has been made vice president in charge of sales for the Wickwire Spencer Steel Company in New York. Also, **William H. Husted** has been made assistant to the president, **E. C. Bowers**. Mr. Husted, in addition to his duties with the company, has been given leave of absence for three days a week to serve as consultant to the raw materials division of the iron and steel unit of the OPM.

H. A. Corre, for the past several years assistant mine foreman for the Consolidation Coal Company in West Virginia, in connection with mechanical mining operations, has joined the staff of the extension division of Pennsylvania State College, State College, Pa. He will be an instructor and assistant supervisor of mining extension.

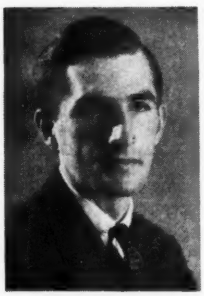
Wade Bond, recently with the Bluefield, W. Va., branch of the Hanna Coal Sales Company, has resigned to enlist in the Army flying service, and has been stationed at Fort Thomas, Ky.

Joseph T. Hall has been elected executive vice president of the Callahan Zinc-Lead Company, Inc., and **E. A. Sale** has been elected treasurer.

Roger K. Kirkpatrick is in charge of testing operations for the Permanente Corporation on a dolomite deposit near Hollister, Calif. He was formerly connected with the Idaho Maryland Mines Corporation at Grass Valley.

C. E. McKay, dredge construction engineer for the Natomas Company, is in Nevada supervising the erection of a gold dredge near Battle Mountain.

Marion B. Walls of West Frankfort, Ill., was recently granted a scholarship at the University of Illinois by the Illinois Mining Institute. He had previously been employed underground for seven years by the Chicago, Wilmington and Franklin Coal Company, and he will study mining engineering at the University. The purpose of these scholarships is to promote the training of worthy and qualified young men for careers in the Illinois coal industry.



Philip D. Reed, formerly chairman of the board of the General Electric Co., and more recently deputy director of the materials division of the OPM, has been made special assistant to Director William S. Knudsen and Associate Director General Sidney Hillman in the materials division. He will be in charge of industrial branches.

Hiram Runnels of Nespelem, Wash., was elected president of the Washington Prospectors and Mine Owners Association at the recent annual meeting at Grand Coulee. He succeeds in the position, **A. A. Elmore,** who has been elected first vice president; **G. H. Beggs** was made second vice president and **Frank Lilly** of Spokane was elected secretary-treasurer. The organization was formerly known as the Washington Prospectors and Miners Association.

Carl J. Trauerman, secretary-manager of the Mining Association of Montana, was recently in Washington, D. C., representing lead producers of the state at a hearing before Leon Henderson, to determine whether the price of lead should be increased.

Henry A. Roemer resigned as of last year-end from the board of directors of the Pittsburgh Coke & Iron Company, Pittsburgh Steel Foundries Corp., and the Alan Wood Steel Co. He resigned these directorates to devote more time to other organizations with which he is affiliated and which are active in supplying materials to the Government.

Tom Bendall, who has been face boss at Castle Gate, Utah, for the Utah Fuel Co., has been appointed foreman of the Castle Gate mine, succeeding the late Jim Westfield.

Ralph Hayden, recently with the Walker Mining Company in California, has been appointed mill superintendent of the Copper Canyon property of the International Smelting and Refining Company at Battle Mountain, Nev.

Wm. A. Gallagher has resigned his position as superintendent for the Minds Coal Mining Corporation at Monterville, W. Va., and has accepted appointment as senior mine inspector with the Coal Mine Inspection Service of the U. S. Bureau of Mines. In his new position he will be located at Vincennes, Ind.

John B. Huttl, assistant editor of *"Engineering and Mining Journal,"* left the States recently to attend the Pan American Congress of Mining Engineering and Geology in Santiago, Chile, in January. While on his South American trip he will visit many of the mining districts south of the border.

H. C. Livingston has been made general superintendent of mines of the Union Pacific Coal Company at Rock Springs, Wyo. He was formerly chief engineer; in that position he is succeeded by **I. M. Charles.**

B. D. Stewart has been appointed manager at Las Vegas, Nev., for Basic Magnesium, Incorporated, and will be in charge of the $60,000,000 plant being constructed there for the production of magnesium.

Vaughn M. Thorne, former executive secretary of the National Association of Power Boat Owners, Washington, D. C., has been appointed to the position of executive secretary of the Ohio Coal Conference. He entered upon his new duties on January 1, and succeeds **H. S. Collins,** of Youngstown, Ohio.

Frank C. Carothers, general manager for the Puritan Coal Corporation, at Puritan Mines, W. Va., has been advanced to the position of vice president of the company.

Max W. Babb has been elevated from his position as president of the Allis-Chalmers Manufacturing Company to that of chairman of the board of directors of the company, and **W. C. Buchanan,** a director and member of the executive committee, was elected to succeed him as president.

E. D. Benton accepted appointment, on January 1, to the staff of the Louisville & Nashville Railway, with headquarters in Louisville, Ky. He will act as fuel engineer, assisting coal producers on the lines of the railroad in marketing their coal. He was formerly connected with the Carter Coal Company.

C. E. Adams in December was appointed chief of the Iron and Steel Branch of the OPM. Following his appointment he named several men in the industry to act as general consultants for the branch, as follows: **J. L. Block,** Inland Steel Co.; **Norman W. Foy,** Republic Steel Corp.; **George G. Bries,** Great Lakes Steel Corp.; **J. B. Honeycutt,** Bethlehem Steel Corp.; **C. H. Linfield,** Youngstown Sheet & Tube Co.; **J. H. McKown,** U. S. Steel Corp.; and **Arthur B. Wiebel,** U. S. Steel Corp.

John A. Robinson, formerly vice president and general manager of the Commerce Mining & Royalty Co., was reelected president of the Tri-State Zinc and Lead Ore Producers Association at the annual meeting held in Picher, Okla., on December 12. Other officers reelected were: vice president, **George W. Potter;** second vice president, **Victor Allen;** treasurer, **L. G. Johnson;** and secretary, **Evan Just. R. O. Gibson** and **John J. Inman** were named directors, succeeding respectively, the late C. F. Dike and the late G. W. Johnson. Other directors were reelected.

— *Obituaries* —

H. C. Auchmuty, who was for many years chief draftsman for Pittsburgh Coal Company, died on January 5.

Walter Trent, 59, manager of the Rocky Mountain Metal Foundation in Washington, D. C., a close friend of the late Senator Key Pittman, and a student of monetary and fiscal problems for many years, died in Washington, D. C., on January 19. He was a mining engineer, graduate of Stanford University, and had been engaged in research aimed at the more extensive use of the non-ferrous metals.

NEWS and VIEWS

Coal Mines Set Safety Mark

After the close of the year the West Virginia State Department of Mines announced that the third greatest yearly tonnage of coal had been produced in West Virginia during 1941, an estimated 140,000,000 tons. At the same time, the state department said, an all-time safety record was established; there were 290 coal mine fatalities during 1941, for an average of 482,750 tons produced per fatality. This figure was 18 percent better than 1940 and 35 percent better than the average for the preceding five years, 1936-1940.

At the same time the department fixed the number of man hours worked in coal mines during 1941 at 573,000 for each fatality, a figure 20 percent above the five-year average. The only two years in which coal production was higher than in 1941 were 1926 and 1927, when 144,603,574 and 146,088,121 tons, respectively, were mined.

Mine employment in January 1941 was 104,000 men, rising to 118,000 in November. Comparable figures for the year 1940 were 109,000 and 104,000 men.

It was also estimated that if the big strike of last April and others of lesser duration had not interfered, the mines of the state could have produced 156,000,000 tons during the year.

New Nevada Dragline

Officials of the Natomas Company, San Francisco, recently announced that a six-yard washing plant and dragline dredge had been purchased from the Ferris Mining Co., which operated the plant in Oregon for several years. The plant and dragline are to be rebuilt and will be placed in operation at the Greenan placer property, Battle Mountain, Nev., which was recently acquired. This property comprises 7,000 acres carrying an estimated 60,000,000 cu. yds. of gravel with a gold content estimated at 20 cents a cubic yard. The equipment is expected to start operation on the Greenan ground in the spring.

Niagara Plant in Operation

A new 100-ton amalgamation-flotation mill recently completed at Niagara mine near French Gulch, Shasta County, Calif., by Lincoln Gold Dredging Co., has started operation. The mine has been leased, together with adjacent property, by the dredging company, which operates a dragline dredge in Trinity County, Calif.

SOLID FUELS COORDINATION ORGANIZED

Howard A. Gray

Thomas J. Thomas

Ralph Park Russell

Harlen M. Chapman

Brig. Gen. Brice P. Disque

The frame work of the organization to carry out President Roosevelt's request for Secretary of the Interior Harold L. Ickes to coordinate the supply of solid fuels, was completed the last of December.

The four top officers to serve with Harold A. Gray, the Acting Director of Solid Fuels Coordition, to aid the Secretary in carrying out the President's instructions that adequate steps be taken to assure that supplies of bituminous coal, anthracite and coke will be sufficient to carry out the expanded war program and civilian needs, are Thomas J. Thomas, president of the Valier Coal Company and assistant to the president of the Chicago, Burlington & Quincy Railway Company, named associate director of Solid Fuels Coordination in charge of bituminous coal; Ralph Park Russell, formerly superintendent of car service for the Pennsylvania Railroad, named associate director of Solid Fuels Coordination in charge of transportation; Harlen M. Chapman, formerly vice president of the Hudson Valley Fuel Corporation, Troy, N. Y., named assistant director of Solid Fuels Coordination in charge of coke; and Brig. Gen. Brice P. Disque, New York City, director of the Peoples National Bank & Trust Co., New York, and formerly president of the Anthracite Institute, New York, named as associate director of Solid Fuels Coordination in charge of anthracite.

Formation of the nucleus of the coordinator's staff was preceded by Secretary Ickes' organization of producers, transporters and dealers in bituminous coal, anthracite and coke on a war-time footing at a meeting of 150 representatives of the various phases of these industries held in Washington in December. At that time the industry representatives enlisted "for the duration" and approved the Secretary's recommendation that a 17-man industry advisory committee be formed to facilitate fueling the nation. The assembly agreed to nominate members for this committee.

Clifton Ore Completes Rail Connection

The Clifton Ore Co., a new iron ore subsidiary of The M. A. Hanna Co., recently completed a 10-mile spur line connecting the mine at DeGrasse, N. Y., with Newton Falls on the New York Central Railway. Completion of the railroad permits the moving of heavy equipment to the mine, and will accelerate mine development and plant construction. Stripping operations in the mining area are proceeding. A sintering plant will be built at the property, capable of producing 1,000 tons of sintered ore daily. The mine will be known as the Clifton, perpetuating the name of the Clifton Iron Company which formerly operated this property.

California Chapter

of American Mining Congress is Formed

Left to right (seated): E. B. De Golia, Albert F. Knorp, Worthen Bradley, A. B. Campbell and Wm. C. Browning; (standing) Robert M. Searls, F. C. van Deinse, C. C. Prior and G. Chester Brown

BRINGING together the most representative group of mining interests ever to come under one banner in California, the California Chapter of the American Mining Congress was formed in San Francisco on January 17.

First planned at the convention of the Western Division of the American Mining Congress in October, last year, the movement went rapidly ahead. Under the kindly guidance of P. R. Bradley, president of the Alaska Juneau Mining Company, who strangely enough cannot qualify as a member of the Chapter he aided in forming because he does not operate in California, representatives of several forms of mining were quickly brought into the new movement. Heretofore a California mining association usually meant that it was made up of gold mining companies. The California Chapter, however, has borax, potash, cement, lime, quicksilver, chrome and other metals' producers on its rolls in addition to the state's traditional gold miners.

Functions planned for the new Chapter include better cooperation with the parent organization as well as coordinated efforts of a state-wide nature. Existing recognized mining associations in California will be encouraged to continue their efforts and to cooperate with the California Chapter in matters of public relations. Thus the California mining industry hopes to have a central mouthpiece as well as a clearing house in such matters.

Worthen Bradley, president of the Bradley Mining Company, was elected president of the new organization. Russell Mumford, of the American Potash & Chemical Corporation, Trona, Calif., is a vice president, as is Roy E. Tremoureux, of the U. S. Lime Products Company. Other officers are: Albert F. Knorp, secretary-treasurer; G. Chester Brown, assistant secretary; and F. C. van Deinse, Yuba Consolidated Gold Fields; William C. Browning, Golden Queen Mining Company; Roy W. Moore, Cactus Queen Mining Company; Senator Thomas McCormack, Natomas Company; A. B. Campbell, Pacific Coast Borax Company; C. C. Prior, Central Eureka Mining Company; and F. W. Nobs, Empire Star Mines Co., Ltd., members of the executive committee.

The Board of Governors consist of the officers and executive committee members, together with P. R. Bradley, Jr., Pacific Mining Co.; B. C. Austin, Ruby Mine, B. C. Austin Co.; R. H. Sayre, Rustless Mining Co.; D. C. Peacock, Eagle Shawmut Mining Co.; Alex F. Ross, Argonaut Mining Co.; Henry W. Gould, H. W. Gould & Co.; H. Clifford Burton, Burton Bros.; J. H. Bell, El Dorado Limestone Co.; E. B. DeGolia, Gold Hill Dredging Co.; H. S. Lord, Dragline Gold Producers of California; Chas. H. Thurman, Thurman & Wright, Thurman Dredging Co.; Chas. G. Patmon, Lancha Plana Gold Dredging Co.; Fred J. Estep, Snelling Gold Dredging Co.; Walter D. Manning, Mother Lode Mining Assn.; Jas. E. Babcock and Robert Linton, Los Angeles, Calif.

Offices of the chapter are 351 California Street, San Francisco.

It's No Time for

"Lead in the Pants"

THE SALVAGE and collection of scrap metal—every possible pound—is a pressing necessity and an imperative task which all industries must assume AT ONCE. Its importance from the standpoint of iron and steel production is vital—indeed crucial. Open hearth furnaces, steel mills, and other war production plants can be strangled to reduced efficiency and even death—UNLESS WE ACT IMMEDIATELY!

EVERY MINE OWNER OUGHT TO TAKE THIS APPEAL TO HEART—

★

"Get it all back into the market, by the pound, the ton, or carload. Act now. Appoint a salvage man. Give him authority. Enlist the cooperation of every man in your employ. Make this a continuing problem."

—Knudsen.

★

Do These Things NOW:

1. Make some person at every mine responsible for this job—and give him encouragement and authority.
2. Send to the Industrial Salvage Section, War Production Board, Washington, D. C., any information on abandoned mines, tipples, spur tracks, etc.; their location, names and addresses of owners.
3. Report to the Industrial Salvage Section, War Production Board, every month from now on, the amount of scrap (tonnage) which you have salvaged or sold.

The job is very much more than simply collecting scrap metal about the mines, or making certain that present scrap piles are turned in. It is a job of wrecking obsolete equipment, as well as cleaning out abandoned properties, either above or below ground.

The scrap is to be disposed of through regular trade channels. The government has already taken steps to put scrap, now and hereafter, in the hands of dealers on an allocation basis. But that angle is not your concern at present.

Scrap price ceilings are now in effect. There is no present prospect of boosting the ceilings. If you know of any situation where substantial amount of scrap metal can be salvaged but at a cost greater than the ceiling price—let us know and we will see what can be done.

Canadian Lead-Zinc Plant To Be Built

Construction of a $1,000,000 plant for recovery of lead and zinc is to be started on property of Reeves-MacDonald Mines, Ltd., in British Columbia, just across the international boundary from Metaline Falls, Wash.

Officials of the company made the announcement at the annual meeting of the company. The project, a war development to be financed by United States funds, is expected to be in production within six months.

Reeves-MacDonald is a subsidiary of Pend Oreille Mines and Metals Company.

Ickes Reports Progress

In making his annual report to President Roosevelt, Secretary Ickes, of the Department of the Interior, stated that long-time conservation programs conceived for the peacetime requirements of the United States have been rushed to completion years ahead of original schedules to meet war demands during the past year, thus mobilizing natural resources owned by 133 million people to serve democracy.

The report emphasized that further prudent development and protection of these resources must be relied upon to play a prominent part in the rehabilitation of a devastated world during the post-war period. Secretary Ickes said that vast hydroelectric and reclamation projects in the West are resulting in an accelerated and balanced industrial and agricultural economy in that region; that we are drawing upon our tremendous mineral resources on an unprecedented scale; and that the immense Federal grazing areas in the future offer a major source of flocks and herds for the starved nations of Europe, where foundation stocks have been slaughtered.

Reflecting years of conservation practices for the preservation of the Nation's resources, Secretary Ickes said:

"With the defense program making unprecedented calls for raw material, the work of the Department of the Interior for the fiscal year ending June 30, 1941, became infinitely more than conservation of natural resources for conservation's sake alone. To this great task was added the responsibility for the wise but rapid development of our resources for preparedness and defense.

"The struggle abroad has opened our eyes as never before, to the extent and the possibility of America's resources. We have been enabled to turn to our natural heritage and in the wealth of minerals, water power, grazing lands and timber find the vital necessities for constructing our physical defenses.

"In order that the Nation may fulfill its function as an arsenal of democracy," he told the President, "we have hastened the development of hydroelectric power in the West. We have never lost sight of more and greater power production as an inevitable objective for a progressive age, but with the quickened tempo of defense needs we have stepped up, by years, the schedules originally set for these great projects. To this we can attribute the speed in construction work on 36 projects in 14 States."

North Lily Explored

The North Lily Mining Company in the Tintic district, Utah, is conducting exploration from the 1500 ft. level of the main shaft, by drifting to the northwest to explore the ground of the Tintic Bullion and Eureka Bullion properties. The main shaft was sunk an additional 120 ft. to the 1,500-ft. level for the exploration operation.

Chrome Conserved By Change In Specifications

American manufacturers of ferrochromium, meeting in Washington in mid-December, voluntarily agreed to changes in specifications, to permit the use of lower grade chrome ores and conservation of higher grades.

Previous specifications of 68 to 69 percent chromium, 4 to 6 percent carbon and 1 to 2 percent silicon were changed to 60 to 63 percent chromium, 6 to 8 percent carbon and 4 to 6 percent silicon by the agreement.

The agreement affected the type of ferrochromium used in making engineering steels running up to about 3 percent chromium and did not affect stainless steel and heat resistant alloy steels in which a larger amount of chromium is used.

The new specifications are a return to those in common use 20 years ago and are approximately the same as the ones in use during the World War.

Company Adopts Defense Bonds Plan

An example of the cooperation between industry and government in selling Defense Bonds was illustrated in a recent announcement of Benjamin F. Fairless, president of the United States Steel Corporation, that the company had adopted a voluntary monthly plan for employe purchases of Defense Bonds. Under the plan, which became effective February 1, any employe of the United States Steel Corporation and subsidiary companies may purchase these bonds by authorizing the deduction each month of a designated amount of earnings.

An employe may authorize deduction from his earnings of any amount in multiples of $3.75. It is also provided that employes who desire to purchase one or more bonds each month may authorize monthly deductions of $18.75 or multiples of that amount. As the purchase price of each bond accumulates in the account of each employe, the corporation and subsidiaries arrange for purchase and delivery of the bonds.

Seven-Day Week in Copper Mines

In December all mine units of the Phelps Dodge Corp. went on a seven-day production basis. The New Cornelia open pit mine at Ajo, Ariz., had been on that basis for some time, and the shaft mines at Bisbee and Jerome, Ariz., later adopted the full time schedule.

The Anaconda Copper Mining Co. also has increased production to full capacity seven days a week.

The Kennecott Copper producing units at Bingham Canyon, Utah, and at Ely, Nev.; Ray, Ariz., and Santa Rita, N. Mex., are producing at capacity. The production at Utah Copper in Bingham Canyon has been pushed to 100,000 tons daily.

Miami Copper to Expand

Announcement was recently made that the Office of Production Management had recommended that the Reconstruction Finance Corporation grant a loan to the Miami Copper Company, Arizona, for an expansion program which will add 23,000 tons of annual copper production to the company's output. It is believed that the amount of the loan will be somewhat less than the $5,000,000 which the expansion program will call for.

The company will bring into production a large disseminated copper deposit at the Castle Dome property in Pinto Valley, about six miles from the present operation of the company. Present plans call for an aerial tramway from the new property to the present Miami plant, which will be enlarged to handle the increased tonnage.

In 1940 the company produced 64,129,683 pounds of copper from 5,300,604 tons of ore. The plant is now operating at the rate of 17,000 tons of ore per day.

Mining School Gets Library Grant

The Montana School of Mines, Butte, recently announced that the Carnegie Corporation of New York, one of the foremost educational foundations of the world, had awarded to the school a grant of $3,000, to be made available in three equal annual installments for the purchase of books for general undergraduate readers. The books will be selected by the college librarian but purchased by the corporation from the fund.

Other institutions have been allotted similar grants, including the Case School of Applied Science, Colorado School of Mines, Drexel Institute of Technology, Georgia School of Technology, Michigan School of Mining and Technology, Rensselaer Polytechnic Institute, South Dakota State School of Mines, Stevens Institute of Technology, Tennessee Polytechnic Institute, and Texas Technological Institute.

New Coal Burning Locomotive

Just before the end of 1941, the Union Pacific Railroad took delivery of 20 new locomotives, costing $250,000 each, and known as a 4-8-8-4 Mallet type. The new locomotives were designed to handle fast freight in heavy grade territory. They are the world's largest and most powerful locomotives; the length is 132 ft., 10 ins., and they weigh 1,189,500 pounds each. Each has a capacity of 28 tons of coal and 25,000 gallons of water, and has a tractive power of 135,375 pounds. The frames of the new locomotives are hinged in the center to permit them to make turns which otherwise they would not be able to negotiate.

Callahan Dredge Completes Season

The dredge of the Callahan Zinc-Lead Co., operating on the Livengood placers in the Fairbanks area of Alaska, completed its first full season of operation last fall and closed down for the winter. The dredge, a Diesel electric with 6 cu. ft. capacity buckets, was completed in 1940 and worked until the end of the season. In 1941 it worked a total of 161 days and handled 777,000 cu. yds., nearly 5,000 cu. yds. per day. The Livengood placers contain 32,000,000 cu. yds. of gravel, ranging in gold content from 44 cents to 64 cents per cu. yd.

Eagle-Picher Reopening Mine

The Eagle-Picher Mining and Smelting Company has announced plans for reopening the old Netta mine in the vicinity of Picher, Okla., to mine low grade ore reserves. The head frame, skip hoist and 2¼-ton skips, similar to equipment installed at the company's Blue Goose No. 2 near Cardin, Okla., is being dismantled at the mine of the company at Ruby, Ariz., and will be reconstructed on the Picher No. 8 shaft on the Netta lease. The Ruby Mine was closed two years ago when ore reserves were exhausted.

Steel-Making Capacity to be Expanded

Upon the coming of war to the United States, W. L. Batt, director of materials, OPM, stated that expansion of the nation's steelmaking facilities, particularly in the fields most vital for war production, will be pushed forward with new speed.

A first step in the steel speedup program is the decision to grant high preference ratings for expansion projects. Ratings in the high military categories will be used.

The immediate aim is twofold:

1. An increase in pig iron facilities, to balance present finishing facilities and to offset expected shortages in iron and steel scrap.

2. An increase in electric furnace and other finishing facilities to provide special treatment steels, alloy steels and specific steel products necessary for war production.

Ratings just below top military projects are expected to forestall any possible delays in getting the expansion program now under way completed in a minimum number of months. All other steps possible to rush the program will be taken, Mr. Batt said.

One now under consideration is to equip an important number of existing blast furnaces with air conditioning units, which can be installed within four or five months without delaying plant operations. It is estimated this will increase pig iron output by 5 to 8 percent for eight months a year, meaning an additional 1,000,000 to 2,500,000 tons a year. This dry blast process also would result in a substantial annual saving of coke.

Steel expansion projects approved to date, totaling more than 7,000,000 ingot tons, Mr. Batt pointed out, are designed to meet specific needs of war production. These are alloy bars, tool steel bars, cold finished bars, armor plate, special steel castings and steel plates. Another consideration of prime importance is the increase in Great Lakes ore shipping capacity. Contracts for the construction of 16 new ore boats already have been let by the Maritime Commission.

Preference Ratings Simplified

After the outbreak of war, and with a subsequent need for speeding up production, the Division of Priorities, OPM, moved to streamline and simplify regulations governing the extension of preference ratings on orders involving less than $500 worth of material.

Such orders amount to approximately 60 percent of the total number of extensions handled in the field by the Army and Navy contracting officers, although these small orders amount to only about 2 percent of the total dollar value covered by all certificates.

Under the previous system a manufacturer who wanted to extend a preference rating had to go to the appropriate contracting officer and have him fill out and authenticate a PD-3 form in order to extend his rating to a supplier. This system still holds for extensions of ratings in transactions over $500.

Under the new system, however, a manufacturer who wants to extend an Army or Navy preference rating to obtain material valued at less than $500 may attend to the extension himself, without the necessity of having a contracting officer go through the previous routine requirements.

This new streamlining privilege, however, may be used only if the material to be obtained with the rating is to be physically incorporated in the finished product covered by the certificate being extended.

Montana Chromite

Arrangements have been concluded between the United States Vanadium Corporation and agencies of the Federal Government for development by the company of chromite deposits in the Stillwater country of Montana. The deposits are 15 miles south of Red Lodge, and are in the same vicinity as the chrome properties being developed by Anaconda Copper Mining Co.

Guards And Watchmen Subject To Wage-Hour

In December the Wage and Hour Division of the U. S. Department of Labor ruled that the Federal Government, states, counties, municipalities or other political sub-divisions of states, are not "employers" under the Fair Labor Standards Act, and men hired as guards by states or political sub-divisions of states during the war emergency may be employed without respect to the requirements of the wage and hour law.

However, employers other than the political sub-divisions of states above mentioned, who employ additional guards or, because of the lack of available manpower, lengthen the hours of guards already employed, must pay a wage to such guards as are engaged in interstate commerce or in the production of goods for commerce to meet the minimum requirement of 30 cents an hour; that is, $12 for a 40-hour week—unless the wage order sets a higher hourly rate for the industry. Time and one-half the hourly rate must be paid for hours worked over 40 each week. This ruling applies to mines and mills as well as to other industrial employers generally.

SEC Rejects Coal Company Reorganization

The Securities and Exchange Commission, in a 97-page report recently recommended to the U. S. District Court in Philadelphia that it reject the plan submitted July 1, last, by three of the four major committees for the Philadelphia & Reading Coal & Iron Co., for its reorganization under the Chandler Act.

The Commission says:

"It is our conclusion that the plan is not within the permissible limits of fairness and is not feasible, and, accordingly, we recommend that it not be approved."

Judge William H. Kirkpatrick, who is in charge of the company's reorganization proceedings, was to conduct a hearing on January 15, to determine whether he will abide by SEC's recommendations.

Coal Supply Coordinated

In early January Secretary of the Interior Harold L. Ickes asked all of the state governors to aid him in determining the solid fuel requirements of all state, county, municipal and other local governmental agencies as a part of his program to coordinate the supply of solid fuels for the wartime emergency.

President Roosevelt had previously asked the Secretary to take appropriate steps to assure that the supply of bituminous coal, anthracite and coke will be ample at all times to meet the nation's industrial and civilian needs to win the war.

A survey of the Federal Government's fuel needs already is under way and appropriate steps are being taken to ascertain all other solid fuel requirements.

In letters to the governors, the Secretary recognized the importance of an ample supply of solid fuels to state and local governmental agencies, and strongly recommended that they should plan their fuel purchases to provide a comparatively large supply for storage purposes.

Bituminous coal, anthracite and coke are being produced at the highest levels in recent years and more than 600,000,000 tons of these fuels were supplied the Nation during 1941. The production of war materials has not so far suffered for the lack of them, and the supply for civilian uses has been ample.

Secretary Ickes did not foresee any solid-fuel shortages, but made his recommendation to the governors and local governmental agencies as a precautionary measure.

Arizona Mineral Occurrences Described

The University of Arizona recently published Bulletin No. 149 of the Arizona Bureau of Mines, with the title "Minerals of Arizona," prepared by F. W. Galbraith. This Bulletin describes the minerals found in Arizona, and the places of their occurrence within the state.

Wheels

(*Continued from page 79*)

Solid Fuels Coordinator

At the first of the year Interior Secretary Ickes appointed the following four associate directors to serve under Acting Solid Fuels Coordinator Howard A. Gray: For bituminous coal, T. J. Thomas, president of the Valier Coal Company, Chicago; for anthracite, Gen. Brice P. Disque, former president of the Anthracite Institute, New York; for transportation, Ralph Park Russell, former superintendent of car service, Pennsylvania Railroad, Northumberland, Pa.; and for coke, Harlen M. Chapman, former vice president, Hudson Valley Fuel Corporation.

The solid fuels industries are fortunate in the appointment of these able men who, among their other duties, have engaged in conferences with the War Production Board officials to insure that a sufficient supply of the scarce materials will be had by mineral producers and machinery manufacturers in order that the continued operation of the mines may be assured.

Anthracite For Foundry Fuel

In the period from about 1840 to 1875, anthracite was widely used as a foundry fuel. The Hudson Coal Company, believing that this use of anthracite could well be revived in the present emergency, has been conducting tests in their shops for the past year and a half to prove that such use would be effective and economical. During this time approximately 250,000 pounds of egg coal have been utilized to produce about 1,750,000 pounds of metal to make conveyor plates, grates and grate bars, cast-iron pipes, locomotive brake shoes, drum pulleys, bed plates, pump parts and other metal parts for the company's operation. Those conducting the test reported that results were so successful that all company castings are now made with anthracite as the fuel medium.

These results were demonstrated recently by the research experts of the Hudson Coal Company to the Anthracite Advisory Committee, which was created to develop additional uses for hard coal.

Chromite Property Producing

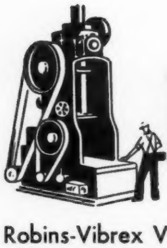
The Little Castle Creek property near Dunsmuir, Calif., was recently reported as producing 50 to 100 tons of chrome ore daily, upon completion of an aerial tramway and other equipment at the mine.

This mine is said to contain 100,000 tons of chrome ore, and developments have been proving increased reserves. During the first World War about 38,000 tons were shipped from shallow workings.

Arizona Wages Increase

Four of the major copper mining companies of Arizona recently granted wage increases of 25 cents a day to their employes, retroactive to November 7. Approximately 8,000 employes of the Phelps Dodge Corporation, and 2,500 mine and smelter workers of the Miami Copper Company, the Inspiration Consolidated Copper Company, and the International Smelting and Refining Company, in the Globe-Miami district, will receive the increase. Comparable raises were granted to salaried employes.

The increase in wages was the third granted to Arizona miners in 1941, and brought the base pay for a six-day week, including time and one-half for overtime for eight hours, to $7.31 per day. The new wage scale was granted to the workers in view of the rising cost of living and the national trend toward higher wages.

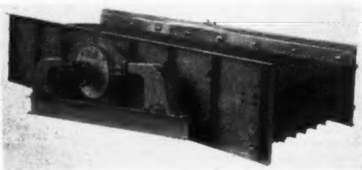


MANUFACTURERS' Forum

Robins-Vibrex Vibrating Screens

The style "M" Robins-Vibrex, a new, high-speed, unbalanced pulley type vibrating screen that will stand up to overloads, has been announced by Robins Conveying Belt Company, Passaic, N. J.

The new screen has a number of



features designed to save power, lubricant, screen cloth and general maintenance costs. Oil-lubricated bearings are super-sealed by means of double action flingers and completely welded splash and dust guards.

Inclination of screen, amplitude of vibration and operating speed may all be varied on the new Robins-Vibrex in order to obtain maximum flexibility of application.

Joy Takes Over Lee-Norse Business

The Joy Manufacturing Company of Franklin, Pa., has announced that it has purchased all the shuttle car patents and the entire shuttle car business of Lee-Norse Company, Charleroi, Pa. The manufacture of this equipment will be continued and will be offered direct to customers by the regular sales organization of the Joy Company.

Customers of the Lee-Norse Company are assured of continued spare part and repair service direct from Charleroi for the present but all orders for new equipment will be handled through the Joy Manufacturing Company, Franklin, Pa.

Black Light Lamps

Instructions and data on the uses of black light for instantly identifying sheelite and other tungsten ores, and featuring illustrations and descriptions of 15 models of Mineralight black light lamps available for this purpose, is incorporated in a bulletin issued by Ultra Violet Products, Inc., Los Angeles, Calif.

Entitled "White Magic with Black Light," it lists many important fluorescent minerals found in the United States, and shows a wide variety of industrial uses for black light, other than mining, which are beginning to receive wide attention.

M. S. A. Opens New Canadian Headquarters

Greatly enlarging its field of service to Canadian industry, Mine Safety Appliances Company of Canada, Ltd., announces acquisition of a new building conveniently located at 139 Kendal Avenue, Toronto, where a broad line of approved safety equipment will be available in meeting the requirements of the Dominion's industrial and mining enterprises.

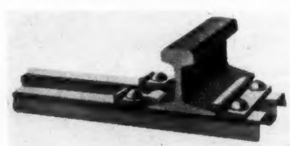
The Canadian-managed and staffed subsidiary of Mine Safety Appliances Company of Pittsburgh will conduct the manufacture and assembly of certain M. S. A. products while stocking all important items made by the parent company.

Mexican Office Moved

The office of the Denver Equipment Company of Mexico City has been moved from the Boker Building to Edificio Jalisco, Calle Ejido No. 7. Santiago Soto, for many years manager of the office, will remain in charge.

Improved Mine Tie

The rapid spread of mechanized mining equipment has caused mine operators to increase the weight of rail sections used in rooms, in order to carry the heavy load of mechanical cutters, loaders, and the larger cars. To take care of this situation, Bethlehem Steel Company has recently brought out a new tie, called



the No. 5 Steel Mine Tie. In addition to its heavier and stronger section, the new tie has a sturdier clip and a larger rivet, to take care of the extra stresses imposed on these parts by the heavier equipment.

The principal dimensions of the new tie are as follows: Width, 5$\frac{1}{2}$ in. Weight per ft, 5 lbs.

The sturdier clips used are $\frac{3}{8}$ in. thick, compared with the $\frac{5}{16}$ in. clip section formerly used. The length of the clip body is also greater to accommodate a $\frac{5}{8}$ in. diameter rivet with full-size head. The tie is recommended for use with 40-lb. rails, or wherever conditions demand a tie of greater strength and rigidity. It can also be furnished with proper size clip and rivet to accommodate 30-lb. rails.

Coatings For Black-out

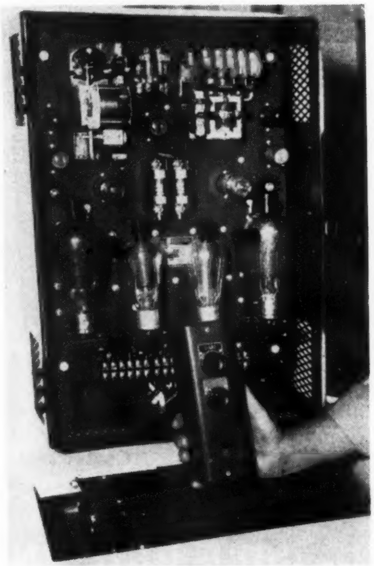
Carbozite Corporation of Pittsburgh announces a new black-out coating for industrial plant windows and skylights that meets all of the authoritative specifications and recommended practices and features easy removal when danger no longer exists. Known as Carbozite Standard Black-out Black, this coating is *not* a paint but a smooth flowing liquid coating, manufactured from a pyrobitumen ore, especially refined and mixed with quick drying, volatile solvents and a secret ingredient which provides complete opacity and an absolutely gloss-free surface. No preference rating or priority is needed to obtain Black-out Black as its main ingredients consist of non-essential hydro-carbons which are not in demand for munitions or other war materials. Of particular interest is its ease of application and outstanding durability under even the most actively corrosive conditions . . . which permits its use anywhere.

Carbozite Black-out Black can be sprayed or brushed on quickly. Only one coat is required to assure complete protection against light penetration and drying is completed in six to eight hours leaving a dead black, gloss-free coating that is as nearly totally non-reflective as is possible to obtain. The importance of the dull finish has been stressed in recent black-out recommendations to neutralize the effects of search lights, aerial flares and other revealing lights which may come into use.

Announces New Electronic Motor Control

As an outgrowth of its thyratron speed control for d-c motors, the General Electric Company has announced a new electronic control system—called Thy-mo-trol—to provide simple, stepless control of direct-current motors from alternating-current lines wherever a wide speed range is needed.

With this new development, the flexibility of d-c motors can now be combined with the economy and convenience of a-c power distribution. The Thy-mo-trol system leads to simplified machine design, reduced space requirements, and a saving in time over more complex methods of obtaining a wide speed range.



Normally consisting of three separate units—a small control station, a transformer, and a thyratron tube panel—the control is the first to provide in one equipment the means for electronically starting, stopping, accelerating, and regulating the speed of a motor. Standard units will cover motor sizes up to 5 horsepower, 230 volts.

The Thy-mo-trol system provides wide-range speed control without the use of motor-generator sets or gear and pulley arrangements. A single-dial control, mounted in a heavy-duty push-button station, covers the complete speed range of the motor, both above and below basic speed. The motor is automatically accelerated to preset speed quickly and smoothly without excessive current peaks. The same single dial can also be used to change speed to any desired value during operation.

Thy-mo-trol equipment can be provided for reversing service by the addition of a standard magnetic reversing switch. It can also be furnished with dynamic braking.

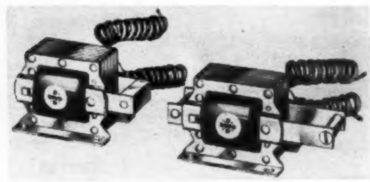
Trailers Replace Steam Transportation

At the Cuba mine of United Electric Coal Company six 33-cu.-yd. side dump Fruehauf trailers are now used for hauling 4,000 tons daily from pit to tipple, a distance of about 2 miles per round trip

New Laminated Solenoid Control

Distinct advance in compact design, with unusual sturdiness, marks a new laminated type solenoid manufactured by Dean W. Davis & Company, Inc., Chicago.

This new solenoid meets the demand for rugged construction and positive reliability in the control of production machinery, the operation of hydraulic valves, and many other



industrial applications. It is for constant or intermittent duty on alternating current, and is furnished with either push or pull type plungers as illustrated. The field coil is paper section wound, taped and specially treated to be impervious to cutting oils.

It measures 2 in. x 2 in. with a plunger stroke of ¾ in. and can be had for any voltage. This solenoid has a minimum push or pull of 5.5 lbs. at full line voltage, and 3.75 lbs. at 85 percent of line voltage.

New Demagnetizer

A new, powerful, portable Demagnetizer is announced by the Ideal Commutator Dresser Co., Sycamore, Ill.

It quickly demagnetizes tools, drills, punches, dies, and work held in magnetic chucks. Abrasize particles such as metallic dust, flakes, fine chips, etc., that simply can't be wiped off clean with a rag are easily removed after a single pass across the magnetic poles.

After the tool or part is demagnetized, it can be laid on a bench or shelf without again attracting nearby metals.

Large parts may be demagnetized in a similar manner, except that the Demagnetizer, which is light in weight and easy to handle, is moved over the heavy, bulky work.

Pumps For a Wide Range of Duties

Practical information concerning pump adaptation for a wide range of duties under varying conditions is the theme of a new industrial catalog

just published by Pomona Pump Co., Pomona, Calif.

This brochure contains illustrated case histories of varied applications, and presents many practical drawings for laying in this type of pump.

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